

# Australian Model Engineering

May-June 1997

Issue 72

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**LOCOMOTIVES, TRACTION & STATIONARY ENGINES, BOATS,  
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**In This Issue:** ☒ **WAGR V class in 1 1/2" scale**  
☒ **A Design for an Ocean-going Tug**  
☒ **Recycled Clocks - An easy way to Horology**



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# Elements of Machine Work

## Companion Volume to Advanced Machine Work

### Elements of Machine Work

by Robert H. Smith

Here it is, the companion book to *Advanced Machine Work* (AMW). And it's quite a nice book even though it covers simpler material than AMW. But first an explanation is in order.

In the preface of our 1919 AMW re-print, Smith mentions *Principles of Machine* as being the companion book. In 1910 that book was entitled "Elements". That same year, what was then "Principles" was greatly expanded to become "Advanced". We could have reprinted 1910 "Principles" everything in it was repeated in 1919 "Advanced", so I don't think you'd let me sell you something you already have.

Confused? I sure am. But that's never stopped me. Just trust me when I tell you that this is the same book mentioned in "Advanced" as the companion tome.

**Contents include:**  
materials used for machine construction, measuring, laying out, chipping, tool grinding, files, hand and machine filing, scrapers, scraping and standard surface plates, polishing, annealing hardening & tempering, high-speed steel, case hardening, pipe and pipe fittings, hand and machine methods of piping, straightening and bending, peening and riveting, hand drilling,

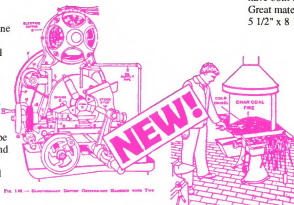


Fig. 148.—Burrer's Simple Universal Machine with Tool

g. 124.—HEATING COAL CHINKS TO HARDEN.

soldering, brazing, babbitting, power transmission, aligning and leveling shafting and installing machines, and more.

If you have *Advanced Machine Work* (and if you don't, then why not?), you know how this book is laid out: lots of illustrations and step-by-step instructions. It is nowhere as large as *Advanced*, but it does an excellent job on the basic material it presents. A lot of this may be too basic for you but I'm sure you'll learn something new nonetheless. So order a copy so that you have both of Smith's classic books. Great material, but you already know that. Get one! 5 1/2" x 8 1/2" hardcover 192 pages

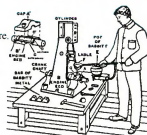


Fig. 192.—BABBITTING ENGINE BEARINGS.

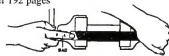


Fig. 61.—SERRATING PITCHER OF HOOK FOR PITCH.

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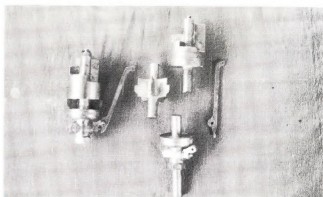
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Issue 72

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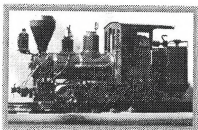
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### The Cover

*V.1244 basks in the afternoon sun as it waits for its next run at the Sydney Live Steam Society, West Ryde.*

*The story starts on page 27...*

Photo: Neil Graham



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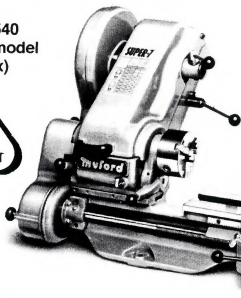
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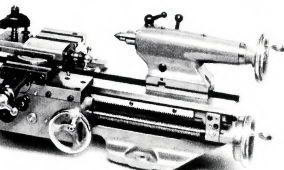
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## Comment

### Hobby Intolerance

There is a side-line to the readers survey that I hadn't really expected. We sometimes joke about the "other person" — the person who prefers a different branch of the hobby. Every hobby does it in one form or another. I guess it just models the more serious "big picture" of racial or religious intolerance.

Fortunately the problem is not widespread, but the tone of the comments indicated that no joke was intended — there are several people who are downright intolerant of other areas of the hobby. It's not limited to the readers survey either, I received a letter once where the writer claimed that he would buy AME if it only had stationary engines, he wasn't joking either!

"Real life" engineering has many disciplines, for example: Mechanical, Electrical, Marine, Civil and Aeronautical.

Model engineering is no different and that's its strength! Many models rely on skills and techniques learnt in more than one branch of engineering. There is no doubt that model engineering has a large swing towards locomotives. However, the other areas have a role of equal importance but suffer only from a lesser following.

The contents of each issue of AME simply reflect the response we receive from each branch of the hobby. There are more locomotive builders, so we get more locomotive stories. I try to ensure that every branch of the hobby is represented in each issue.

It was bad enough with the "battle of the gauges", don't have a "battle of the branches"! We are all part of the same tree receiving our nutrition from the same source.

I'll leave you with a positive comment from the survey:

"If I am browned off about something [in AME], others may like it".

Happy reading.

*Brian Carter*



### To our new reader

If this is your first issue of Australian Model Engineering, welcome! We hope you'll look forward to the ideas, news and camaraderie in each bi-monthly issue.

One of the great things about our hobby is the way model engineers actively help each other. Unless you live in an isolated community, you'll soon discover who has valuable experience in your field of interest, or who will help you to make a part that's too big for your workshop machinery. Look in the *Club Roundup* section to find a club that's near to you; pay a visit and you'll usually find model engineers who live not too far away. Then you can experience the great fellowship that makes our hobby special.

This magazine is prepared in the same spirit of "model engineers helping each other". About two dozen people put many hundreds of hours work into each issue — all on a voluntary basis — to help model engineers in Australia and New Zealand keep up to date and stay in touch.

We rely on our readers to write articles for us — for the same (non-existent) rate of pay! If you have ideas or techniques that you feel would be interesting to others, please drop us a line. We'll gladly help with preparation of artwork or editing if that's necessary. Most important of all, please support the people who advertise in our magazine. Without them to pay the bills, you wouldn't be reading this!

*Brian Carter*

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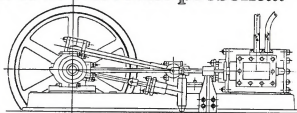
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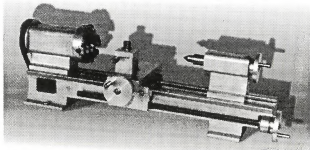
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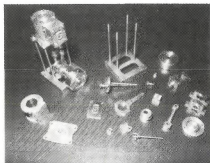
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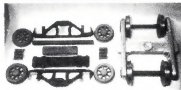
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# Recycled Clocks

Story and photos by Don Payne

There are still many modellers who due to lack of equipment etc, etc, do not have a go at making a clock. May I suggest an alternate to the traditional method of starting with raw material is by recycling old parts and "build" yourself a clock — I warn you that you will not stop at that point.

Throughout the world there are many clocks languishing in cupboards because they are too good to throw out, belonged to "Aunt Maud", do not suit the present decor, etc, etc. Sometimes (but more rarely these days) bargains can be obtained at opportunity shops, church bazaars, garage sales or as gifts from friends because you like to "tinker".

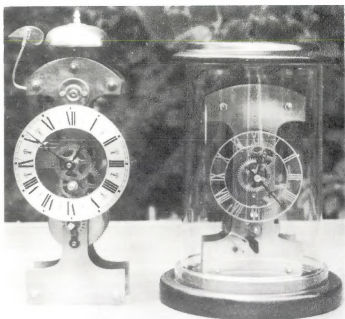
Having had another look at the old clock that you have acquired, make up your mind if you are prepared to recycle it in some new form. I do not advocate the recycling of any clock of value but only those which will never again, in their present form, do the job for which their maker intended. The two clocks shown in **Photo 1** were built-up from the working trains of post war mantle chiming clocks.

This cannot be a construction article as there are so many variations in available old clocks.

The clock chosen should have the spring encased in a barrel and it is advisable to check that the clock will at least tick over in its present form before rebuilding.

Remember that the wound power in a spring is very great and all the springs should be "let down" carefully before attempting any dismantling of the works.

If you have a choice of movements select one with larger toothed wheels for better appearance in the open type skeleton clock, a reason-



*Photo 1. Two recycled clocks.*

ably long pendulum as the clock is going to be heightened in its new form, and a solid type pellet rather than the pressed metal pallets in some of the cheaper clocks.

Having selected your clock let down the springs and dismantle the clock movement. The case, hands, dial and striking section will probably not be re-used. Lay aside for re-use the going train wheels from the spring barrel to the escapement and the pendulum (if you are lucky enough to have one with your clock).

Obtain some sheet brass of approximately the same thickness as the existing front and back plate.

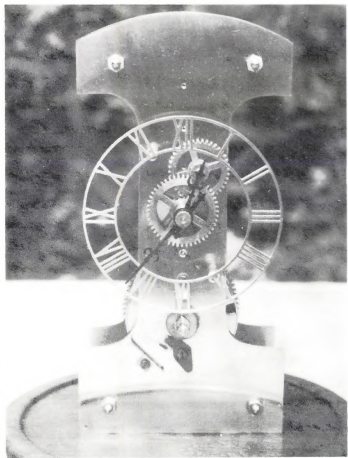
On a sheet of paper on a vertical centre line lay out approximately the centres between each set of arbors to determine the new overall width of the clock. By setting each arbor directly above the other this will heighten the new clock considerably depending on the wheel diameters.

You will now have some idea of the shape you want for the new clock and this can now be roughly sketched out to give vent to your artistry in design. Remember the more flamboyant the design, the more cutting out you have to do. A bit like some loco frames.

I prefer to keep a simple shape and focus the eye appeal on the dial and hands.

Cut your brass sheet into two pieces which will adequately cover the rough design you have worked out and square these sheets up as has been adequately described by other writers with  $\frac{1}{16}$ " diameter reference holes in two corners for holding the two plates in correct position by  $\frac{1}{16}$ " brass brads whilst all marking out, sawing, filing and drilling takes place. It may be possible to place these reference holes outside the overall design shape so that they do not appear in the final clock.

Coat the front plate with suitable marking fluid. I find a wide felt marking pen ( $\frac{1}{2}$ " wide) very suitable (Artline 100). Mark the vertical centre line. Do not put in heavy scribed lines as all marks have to be removed from the brass later on. It is probable that your old clock has four pillars nipped on each side and these after cleaning up can be re-used. Mark out on your plate the best position for these four pillars keeping well within the confines of your proposed design. Drill these four holes through both plates held together by the locating pins to a size which will give a neat size over the thread. Some pillars in better quality clocks have spigots larger than the thread and this is the size by



*Photo 2. Clock recycled from the working train of a 1941 mantle clock (right in photo 1). The case is removed for clarity.*



Photo 3. A recased Ansonia mantle clock.

drilling and reaming which should be aimed for. If you do not have drills or reamers to suit these registers it may be possible to turn the register to a size to suit your reamer but the aim is for a good fit in the front and back plates to maintain the alignment of the clock. De-burr all holes after drilling being careful not to scratch the plates.

Mark out from the bottom of the plates on the vertical centre line the required position from your rough layout starting with the spring barrel arbor a reasonable distance up from the bottom of the plate. Determine from the spring arbor which side has the smallest diameter pivot and accurately drill and ream both plates (still held together with the locating pins) for a neat running fit on the pivot. The larger hole can be opened out later. Now make up a brass locating plug which will locate in this hole and in the old front plate of your original clock.

Using the old front plate as a jig swing it around the plug until the next arbor hole is located on the vertical centre line. Clamp in this

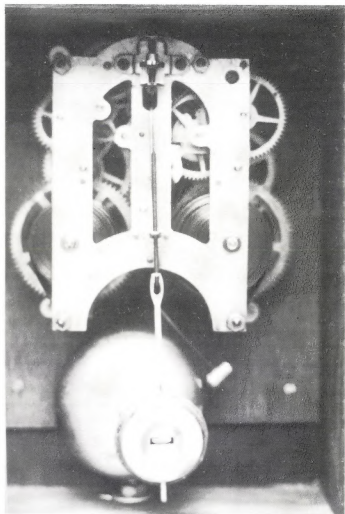


Photo 4. A view of the movement of the mantle clock in photo 3.

position and drill through the plate hole with a drill of a size equal to or less than the micrometer size of the pivot, provided of course that the old front plate hole is smaller or the same size as the old back plate hole.

Constantly checking your pivot sizes and hole sizes proceed similarly from arbor to arbor up the new plates using the old front plate as a jig. If drills of the right size are not available drill as close to size under as possible and ream up to a good running fit on the corresponding pivot. Suitable clock reamers complete with little plastic handles are available from clock suppliers and are not expensive.

Proceed similarly with all holes and openings in the old front or back plate locating them in either the new front or back plate accordingly using the old plates as a drilling jig or as a template. Tapped holes for click springs, back cock, ratchet retainer, etc. are best tapped to the nearest B.A. size for which you will probably have drills and taps and make new screws or use available B.A. screws.

I assume that somewhere along the line you have cleaned and examined all the parts you are going to use. Polish all arbors to a good finish and burnish the pivots and clean and polish the brass wheels and lacquer without getting any lacquer in the teeth.

Before proceeding to mark out and cut the plates to the shape of your fancy you could now try a trial assembly and if the old clock worked it should now again work in its new plates as nothing but the vertical alignment has been changed.

Be careful in the positioning of the hour/minute wheels on the front face as if retained in the vertical mode the hole may be too close or coincide with an already drilled pivot hole. Swing in an arc a few degrees and it will still look satisfactory.

With an open clock of this skeleton type a good dial and hands will set it off nicely.



Photo 5. Recased Fusee mechanism.

Again suitable dials and hands are available from clock supply houses and with luck you may get hands which fit without alteration.

On striking clocks it is usual to find a snail piece on the hour wheel but this can easily be turned off or if your new hour hand doesn't fit it is probably easier to make a new pipe to the right size using the old one as a pattern and remount the wheel. Soft solder carefully applied is the easiest way of remounting the wheel.

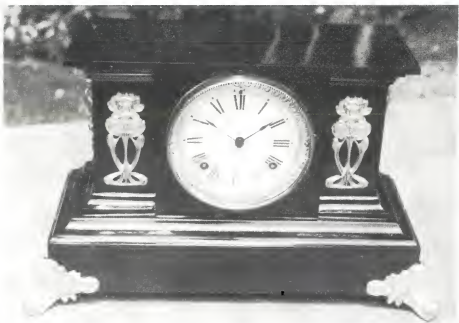
The dial will need to be mounted on suitable brass stalks to stand it out from the front plate. I usually Araldite the stalk to the dial and fix through the front plate with a nut. Two stalks are sufficient but again care will be needed to locate the holes in the front plate to avoid any existing holes. The 6 and 12 o'clock position is desirable but not always achievable as this brings the locating holes onto the vertical centre line. On my clock the stalks are at 11 and 5. If possible choose a dial diameter which will miss the winding square otherwise a hole has to be drilled through the dial at the 6 o'clock position.

Having now set out all the various parts proceed with the final design of your plates and cut them out with Abrafile, jewellers hacksaw etc, and finish, polish and lacquer all parts.

Clean out pivot holes before final assembly.

Use a good quality clock oil for best results rather than light mineral oil (sewing machine oil) although 3-in-1 oil is quite good for the main spring which should be thoroughly cleaned of all old oil.

A suitable cover will be required to keep out dust and if your clock has turned out a showpiece a base and dome would be justified. These domes are available (usually in acrylic) from clock suppliers.



*Photo 6. Restored cast iron cased Ansonia*

However a suitable substitute can be made by obtaining a clear biscuit barrel of the right size (take your clock along to your local kitchen ware shop) with a turned wood base and a turned wood top and handle fitted to the upside down barrel.

As these are not serious horology pieces I do not recommend more money or time being spent than is necessary but such a break from modelling will whet your appetite for more serious projects.

Earlier I mentioned that I do not advocate the recycling in this way of good mechanisms but where a mechanism is complete and in good order and lacks a case it could, as in **Photo 3**, be re-cased. This is an American Ansonia mechanism which came to me without a case and dial but the mechanism and hands were in remarkably good condition and a new case from old pieces of Australian Red Cedar was built and a dial added, being the only purchased item. A bell from an old alarm clock has been used in place of the spiral gong which was missing. See **Photo 4**.

**Photo 5** shows a recased fusec mechanism in very good condition obtained at a Railway auction and was originally in a steel case at a bus terminus. These have now been replaced by electric units. Again dial and hands are purchased.

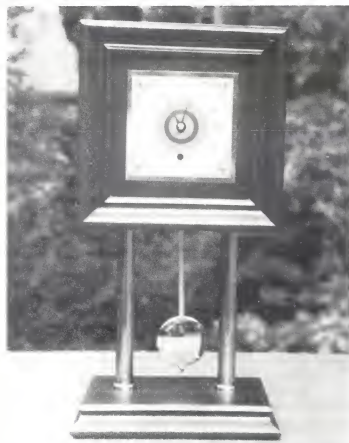
A year or Anniversary clock was obtained in a derelict condition and was well beyond any hope of restoration with most parts broken or missing but the base and pillars after cleaning up were in good condition and the dial and hands were intact. All wheelwork was removed and the remaining parts cleaned. A small quartz movement was obtained from a kitchen clock on sale at a supermarket for a cheaper price than quartz movements can be obtained from clock suppliers. The plastic case, dial and hands were disposed of and the quartz movement fitted nicely between the brass front and back plates and even allows for convenient battery replacement.

However, it should be noted that the dials on these clocks are enamel on copper and any attempt to enlarge the centre hole by drilling or reaming will shatter the dial. This timepiece is probably more accurate in its present form than ever in its previous lifetime.

The clock shown in **Photo 6** is a restored cast iron cased American Ansonia.

Clock movements are available from clock suppliers, **Photo 7** shows a clock built up from a cheap German movement housed in an Australian Red Cedar case constructed from mouldings from a century old cedar door. The dial and hands are commercial items.

I trust that this article has shown that there is a wide scope for bringing back to life a clock which you may have and arouses an interest in more serious clock projects.



*Photo 7. Commercial German movement fitted in a cedar case.*

# Rotorua — Te Amorangi

Story and photos by Charlie Lear

*Charlie Lear, one of our NZ representatives and President of the Hutt Valley Society of Model Engineers, will be presenting occasional reports from around the New Zealand club scene. I hope you enjoy his first installment... bmc*

The highlight of summer was, for me, to be a trip to the open weekend of the Rotorua SME on 10, 11 and 12 January 1997. Unfortunately, that weekend coincided with the arrival of Cyclone Drena! Proof indeed, that no matter how carefully you plan everything you still can't dial up good weather on demand.

Colin Osmond and I arrived at the track at 5pm, model engineers had been there — there were passenger trolleys on the grass — but no signs of life apart from muddy footprints. After wandering around for a few minutes, we were stopped by a bloke with his small son who asked when the trains would be running! We gave him a best guess of sometime after 9am in the morning.

Saturday dawned cold and wet, but undaunted we set off. The Rotorua track is at Te Amorangi, on Robinson Ave in Holdens Bay. You head out of town on the road to Tauranga and turn off just before the airport. Quite a few people were there already, standing under the tarpaulins, and two locos in steam. Because of the humidity, both locos were puffing out large clouds of steam as they circulated around with one or two passengers.

Dave Giles from the Manukau club was driving his yellow *Phantom*, 7¼" gauge 2-6-0. This loco has covered a lot of hard miles and has been seen just about everywhere — sounds a bit like Dave himself!

The other loco, a battered-looking 5" gauge 0-6-0T named *Fiona*, is owned by Les



*Harold Sinclair (standing on right) watching his 7¼" gauge 2-4-4-2 Broken River RR No.26, about ready to depart for another run.*



*Dave Giles with Wasp, a battery-electric 7¼" gauge 0-4-0.*



*Dave Giles' 7¼" gauge 2-6-0 Phantom.*

Moore from Tauranga. To the Reeves' *Gert* design and almost 25 years old, it was being driven enthusiastically by Graeme Castleton who is some years younger than the loco! "Enthusiastically" sums up everything Graeme said or did — he was operating at a hundred miles an hour all day and I don't think I saw him sitting down once except on a driving trolley. It's really good to see a young bloke with a highly charged case of the live steam bug and it brought back memories of how I was at his age. It was equally good to see the amount of help, advice and good humour the older guys were giving Graeme. Being treated in a similar way caused me to be hooked on steam, and I'm still grateful.

There's a photo of Graeme driving *Fiona*, but not much of one — as I pressed the shutter

he leaped off the trolley asking if it was a good picture. Ah, the futility of asking him to keep still for two seconds!

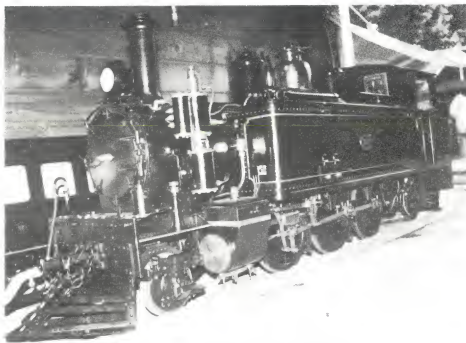
Without much else happening, the rest of the morning was spent nattering under cover to a lot of people I hadn't seen for years, and to others I'd never met but had seen their names in various club newsletters.

John Heald from Rotorua is working on the late Nigel McCrimmon's loco after having completed his own 7¼" gauge NZR Wa class 2-6-2T. This loco has a number of unique features, including a full Westinghouse brake system as per prototype — until you look closely. The Westinghouse pump on the left of the smokebox is a donkey pump for the boiler. One of the compressed air reservoirs on top of the tanks is the lubricator oil tank, and another is the whistle. A scale whistle is also hooked up in the right place and the system works a treat. John didn't steam up while we were there, but it had been working all day Friday. "You should have been here yesterday — the weather was beautiful!"

Also from Rotorua, Paul Newton was not content to rest with his big NZR C class and is starting another major project — a 7¼" gauge NZR Ja class 4-8-2. The loco and tender will be eighteen feet long when finished! I'm going to have to keep in touch to monitor progress on what will no doubt become a beautiful loco.

Among the gossip traded was the snippet that Peter George recently suffered another case of the highly charged steam bug. He was so enthusiastically firing his Fowler traction engine en-route to Fielding that one extra-strong heave sent the coal and the shovel into the firebox! The rumour mill didn't speculate if he enthusiastically hand-fed the fire from that point.

Trevor Chapman, a visitor from Tauranga, had his interesting 5" gauge 0-4-0T Welsh contractors' loco with him. It's around four years old, and he raised steam for another young visitor, Douglas Medlicott, to have a drive. This loco has a tubular firebox and a one-



*John Heald's 7¼" gauge NZR Wa class 2-6-2T*

piece combined grate, ashpan, arch, firehole door and damper which slides out as a unit when he wants to drop the fire. An excellent idea and a very well-made little engine that circulated happily for the rest of the morning.

The catering for visitors by the Rotorua club was up to its usual high standard and nobody went hungry at lunchtime.

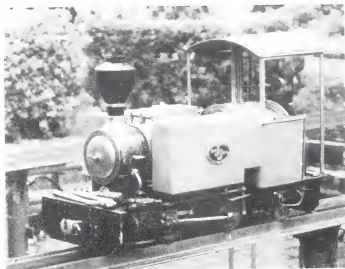
### **Te Amorangi museum**

Colin and I went for a wander around the rest of the Te Amorangi museum and were very impressed with the progress made in the last few years. Te Amorangi is a working museum, with a number of the exhibits powered by steam, plus many displays of colonial living set in beautifully maintained grounds. There's the old Whakarewarewa post office and the original Rotorua jail, a recreated street from the 1920s and many horse-drawn carts and implements.

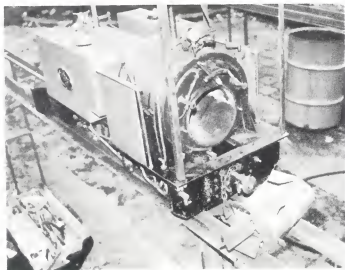
Inside the main steam shed, the custodian Bryon Somervell was busily stoking the Anderson wood-fired boiler. It's an 8hp under-fired multitubular with an evaporative capacity of 640lb/hr, which is a good size for the work it now does. It carries a little plaque — as do most of the exhibits — with more details. It was built in 1960 and carries the maker's number 2220.

Steam from the boiler feeds a number of stationary engines and the big Ingersoll-Rand air compressor. This last is a wonderful bit of machinery but conditions unfortunately prevented a good photo from being taken. Suffice it to say that it is big, and delivered a remarkable quantity of high pressure air.

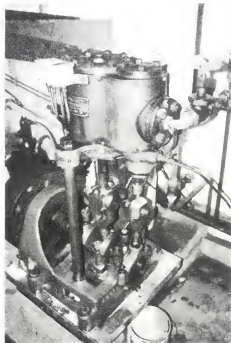
The three stationary engines against the far wall proved easiest to photograph and examine closely, especially when Bryon offered to stop them for a minute. I've never been much



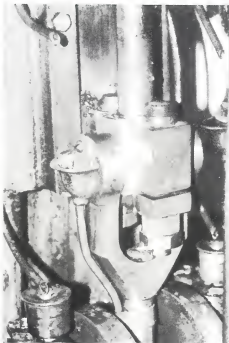
*Trevor Chapman's 5" gauge 0-4-0T "JJ".*



*"JJ" showing off its circular firebox and removable grate/ashpan.*



*Drysdale engine.*



*Close up of the Drysdale crosshead showing the big-end drip feed lubrication system.*

of a stationary engine fan, which explains my reprehensible failure to record the bore and stroke of the engines I saw, although I've read Dave Harper's columns with interest. These three have made a lasting impression and a couple of days ago I found myself idly doodling a horizontal cylinder without realising it!

The most fascinating one, and the one with the most interesting history, is a small green single cylinder horizontal with a non-revers-

ing eccentric driving a slide valve. This was built by the engineer David Murray in Wanganui in the 1860s. It was originally supplied to a sawmill, then it was a brewery for some time before going to the Spa Hotel at Taupo in 1931. Here it drove a generator and was fed by steam from a geothermal bore — certainly the first in the Southern Hemisphere, and the NZED feel it predates the more famous Italian site, making it possibly the first in the world.

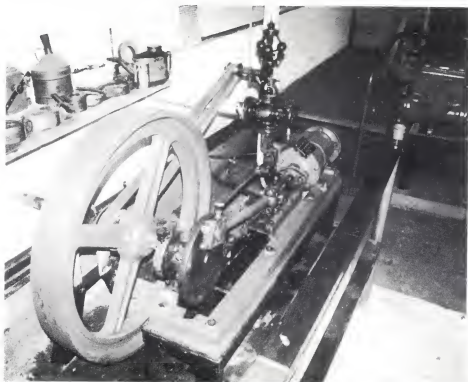
With a tiny amount of steam it ticked over gently, the cast iron crosshead and guide polished to a mirror finish. Very little apparent wear even though the engine is over a hundred and thirty years old, and as Bryon says, keep it oiled and it'll still be running in another hundred years.

Next to it is a blue Drysdale non-reversing piston valve double-acting single, from the generating plant at Ellis and Burnand's mill at Minginui. This is a very solidly-built engine and looks very heavy for its size. What I found interesting about this engine was the way oil is delivered to the big end — an oil pipe ends in mid-air, and a cup attached to the connecting rod and piped directly to the big end catches the drips. This may be common practice for all I know, but I thought it to be a very simple and elegant piece of engineering.

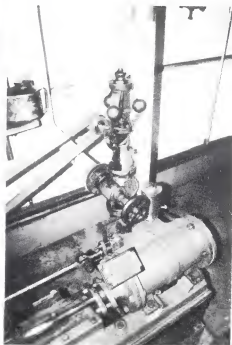
The third engine has a somewhat mysterious past. It is a Ruston Hornsby vertical single of indeterminate age, although it is known they stopped making engines like this in 1896. Bryon thinks it may have originally been mounted on a trolley with a small vertical boiler and used out in the bush. It was purchased as an incomplete wreck from the Miles Bros sawmill at Ashley Clinton, and by some lucky coincidence was matched up to some rediscovered parts. Certainly a lovely piece of restoration.

Behind the compressor stand rows of old oil and steam engines, relics of New Zealand's farming and forestry past.

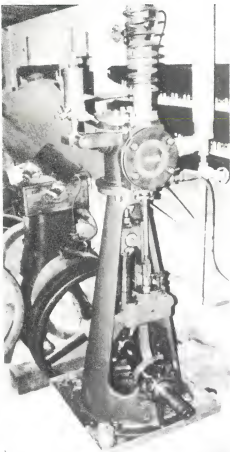
Outside the steam shed is a newer structure, purpose-built to house the twin cylinder compound Bellis and Morcom generating set from 1929. The enclosed engine has 13" and 21" cylinders and 9" stroke, and is coupled to English Electric alternators. At 150psi and



*A David Murray, Wanganui built, single cylinder horizontal engine.*



*The "business end" of the David Murray engine.*



Ruston Hornsby vertical single cylinder steam engine.

428rpm, the engine develops 225hp and the alternators 150kW.

It was delivered in 1929 to the Hikurangi Coal Co. then the engine was moved to the Waipa mill in 1939. In 1961 it moved again to the Mamaku mill before being transported to Te Amorangi in December 1994. Unfortunately the Anderson boiler doesn't have the capacity to steam the generator set, but if it did there is no doubt it would run as sweetly as it did throughout its working life.

When I last went to Rotorua for the open weekend in January 1995, the engine was sitting outside on a concrete pad and covered in tarpaulins. The current condition of the engine and surroundings is a real credit to the hard work put in by the museum team.

Sharing the building with the genset are some wonderful pieces of steam memorabilia, including two Dobbie-McInnes indicator sets in their fitted boxes. It would be next to impossible to put a value on them. In a few years time I doubt if we could find many people who know what they are and certainly nobody who would know how to set them up.

Last on the brief walk around the museum, but most certainly not least, is the 2-cylinder 8nhp compound McLaren traction engine. Maker's number 455, it has 6½" and 10" cylinders and 12" stroke. Working pressure is 140psi and two gears, giving 3mph and 6mph at full speed of 200rpm. It may not win any

racers but I wouldn't like to be in any small building that got in the way!

## Back to the track

Back to the station and Dave Giles had finally done the decent thing and taken his *Phantom* off the track. We'd joked all morning that the weather would come right as soon as he did, and sure enough — the sun broke through just as they were loading it into the van. He kept smiling, which is the main thing.

Meanwhile, John Herman's *Speedy* had been fired up and was chuffing along in the company of two diesel shutters, one petrol and one battery-electric.

Being unable to stay another night, Colin and I left for the long drive home. Of course, the weather fined up for the Sunday and everyone had a great time without us.

On the way, we saw the Ohaaki geothermal power station and I showed Colin over the Wairakei steam bore field. I was able to babble on with great authority because I'd just finished reading up about it, as I spend a lot of my working time dealing with computer systems in the energy business. Next time I'm up that way I'll have to be cheeky and ask the guys on-site if I can come in for a look.

## Trouble at Thames

Back home to much better weather, and the sad news that the Thames Small Gauge Railway had been inundated by the cyclone. They have completed the station and were laying the station track and yards, and were just laying it out to where the main line will come in when the storm hit.

Bob Sharman reported that the large swell, unusual on the Thames coast, didn't get into the station but washed all the bedding material out from under the track. Saturday afternoon the Civil Defence brought in the big trucks and built a new sea wall. They now have a metre high embankment all along the sea front and right in front of the station, exactly where the track to run north was being laid.

One possibility is that if the embankment can be tapered off to suit the track, the club could run on two levels. As Bob says, it is early days yet as they will have to wait for the officials to decide their next move.

## Contact

There's many open days coming up on the New Zealand calendar. Time and work permitting, I'll try to get to the local ones but would appreciate photos and information from further afield. I can be contacted most easily by email to clear@ibm.net or by post to PO Box 42-000, Wainuiomata, Wellington.

If you can let me know of any events coming up in your club, with at least three months' notice, I should be able to get them published in advance.

Keep your fires bright and the smoky side up.



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# Steam Chest



with Dave Harper

Hi there, steam fans and welcome to another collection of steamformation.

Not a lot of correspondence this time around, I think the hot weather has made doing anything more than strictly necessary just too much bother! That's certainly how I've felt!

However, the article on the Peter Brotherhood radial engine in the November-December 1996 issue had some unexpected results; Don Payne, my co-author on the article has received a whole bunch of material on Peter Brotherhood Ltd., who are still in business it seems. It appears that one of our readers has a friend who happens to be the Australian agent for the company, who was moved to pass on a load of stuff which will be shared with you all.

## Last call from Burgh

I seem to have just about covered all the really weird engines from *Burgh's Modern*

*Marine Engineering* over the past few issues, so this time it's a more-or-less conventional setup that's on offer.

It is a pair of engines and boiler built by Maudsley Son & Field for a naval launch. The engines are mounted directly on the sides of the firebox of the locomotive style boiler, the layout is quite clear from the drawings.

This seems a layout that could well be used in a model launch, or even as a standalone model. In a model boat it would enable the whole boiler and engine assembly to be quite simply removed by disconnecting the shafts. It is also very compact, and the boiler doesn't necessarily have to be a true locomotive type.

The original unit was built for a 42' x 10'6" x 3'9" launch. The boiler barrel was 3'7" long by 2'1" dia with 31 x 2" tubes. The boiler operated at 65psi.

The engines were duplex units of 5" bore x 6" stroke and each drove a 4-bladed prop of 2ft dia x 3ft pitch. The props were of opposite hands, and at around 350rpm gave about 7 1/4 knots.

There was a donkey engine feed pump mounted on the side of the smokebox of 1 1/2" bore as well as a 1 3/4" x 2 1/2" feed pump driven of the end of the engine crankshafts.

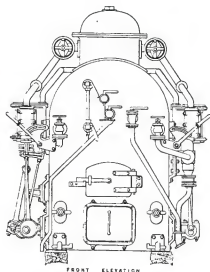
The "hairpin" or "tuning fork" connecting rods seem to have been popular in that period when machining flat crosshead guides was still a new concept.

The crankshaft bearings and piston rod guides were simply mounted on the sides of the firebox, altogether a very neat and compact layout.

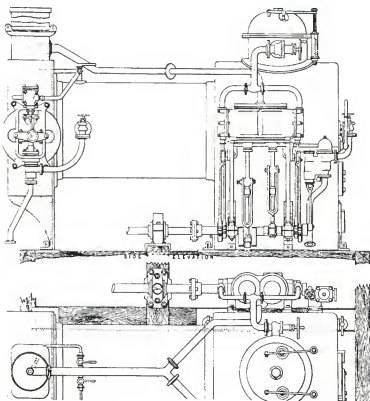
It was certainly a popular setup in its day as there are details of a very similar unit built by J & G Rennie also in Burgh's book. I chose Maudsley's one because the drawing is of better quality, and the only major difference is that Rennie used a multitubular boiler with return tubes.

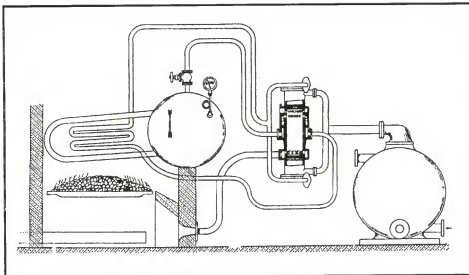
## Some kind of Still?

Some time ago our library at the Queensland Steam & Vintage Machinery Soc was donated a collection of seven bound volumes of the *Commonwealth Engineer* magazine dated between 1913 and 1921. Although the bindings are pretty daggy we were delighted to save them from the dump and they have proved absolutely fascinating. I'm still only on the second volume, being knee-deep in other books at the moment, but one article



TWIN-SCREW ENGINES AND BOILER.  
OF ONE OF  
H. M. S. LAUNCHES.  
BY  
MESSRS MAUDSLAY SONS & FIELD.





Diagrammatic sketch of the Still system, showing connections between jackets and boiler; connections between boiler and steam admission ports; condenser (right) lead of exhaust gasses to boiler.

seemed crying out to be reproduced in *Steam Chest*.

This is called *The Still Engine* by H. N. Smith in the September 1919 issue.

The Still system was touted as a way of improving the thermal efficiency of IC engines by using steam as well... anyone shaking their head at the thought is well justified!

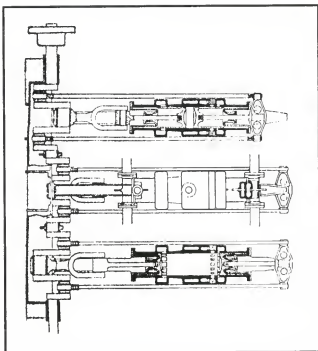
To quote from the article:

"The invention is characterised less by revolutionary departure than by sheer carefulness in the application of what seem obvious precautions against heat-loss. Briefly, the essence of the Still system is to replace the water jacket of an internal combustion engine by a steam jacket which shall be in series with an auxiliary boiler. The exhaust heat shall be used to effect the preliminary warming of the boiler feed-water.

Steam is thus derived either from all three, or from the first two, of the following sources:

- 1. the heat imparted to the cylinder walls of an internal combustion engine,
- 2. the exhaust heat of the same engine;
- 3. an independent fire under the boiler. This steam is to be expanded in the same cylinder as that used for the internal combustion cycle, but on the other side of the piston.

In this manner, the Still engine is a double acting power unit, of which one side of the



Vertical section through a three-cylinder, opposed piston type of Still engine. Notice the shape of the cylinder covers, whereby the rate of heat flow from the pistons to the steam is increased.

piston is a steam chamber, and the other side of the piston is a combustion chamber."

The article claims that any type of IC engine can be improved by the Still system, petrol, gas or Diesel. The drawing of a three cylinder opposed piston type engine, resembles the Duxford marine engine in layout.

The Still people claim to have improved thermal efficiency from 33 to 43% and more under certain conditions.....

I recall reading of an attempt to build a locomotive powered on the Still system which proved an expensive failure, the whole thing getting just too complicated to be either economical or reliable.

The main diagram, reproduced left, I find more nearly reminds me of a whisky still than a practical power plant! Maybe that's where the name came from.

## More from the Sampson collection

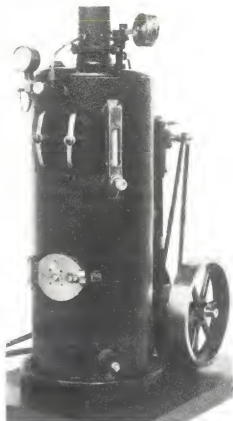


Photo 1: Vertical Boiler by Dave Sampson. The manhole, lever safety valve and blowdown valve are non-operational fittings added to enhance the realism.

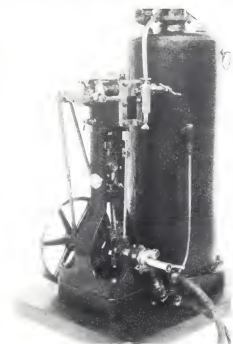


Photo 2: The other side of the boiler reveals a  $\frac{3}{4}$ " bore by 1" stroke engine. The governor system works!

To return to the realms of practicality, here are some more of Dave Sampson's collection of totally sensible and immaculately built models!

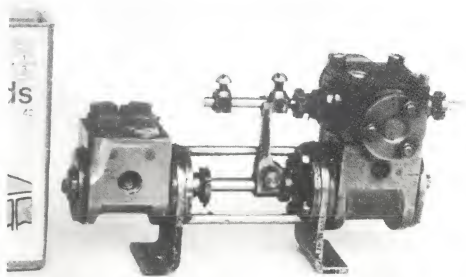
Photos 1 and 2 are of a neat little power plant comprising a vertical coal-fired boiler and a  $\frac{3}{8}$ " bore x 1" stroke vertical engine.

The engine is all fabricated, no castings used, and is accurate right down to the operating governor and feed pump.

The boiler has a lever type safety valve, but Dave did compromise by making the manhole cover a dummy! The brass makers plate has his name on it....

Finally, photo 3 is a simplex horizontal pump with  $\frac{3}{8}$ " bore steam cylinder,  $\frac{1}{4}$ " pump bore and  $\frac{3}{8}$ " stroke. The shuttle valve is one of Dave's mysteries that I must wrinkle out of him sometime!

That seems to be about it for this time around, happy steaming!



*Photo 3: Dave Sampson's Simplex horizontal steam pump.  
Bore:  $\frac{3}{8}$ " (steam)  $\frac{1}{4}$ " (water) Stroke:  $\frac{3}{8}$ "*

# Starting out with a new Milling Machine

by courtesy of "Loco" — *Big Wheel News* magazine

So you have finally bitten the bullet and gone out and bought that vertical milling machine you have been looking at for the last so many years. At last, you say to yourself, I will be able to do all of those milling jobs with ease, instead of slowly doing the job in the lathe. Alas, like so many other things, the purchase of your mill was only the beginning.

Even more so than a lathe, a mill is only as good as the attachments that you have to go with it and, if you intend to buy all the bits that you need, you should count on spending as much on the attachments as you did on the machine.

## Holding the cutters

The first thing that you need is some sort of collet chuck to hold your cutters. A drill chuck should only be used in an emergency and only used with extreme caution. The reason is that an end mill held in a drill chuck will steadily creep out during cutting. At best this will cause great trouble in holding accurate dimensions, and at worst can cause serious damage to your new mill and injury to yourself as the cutter grabs. A proper milling chuck uses collets to hold the cutter, while most good makes incorporate a thread to engage the thread on the cutter shank, giving a self or auto locking feature under load. Collars are available in a range of Imperial and metric sizes.

## The cutters

A few words about cutters are now in order. There are three main types of end mills.

**Slot Drills** have two cutting faces, arranged to allow the cutter to penetrate into the workpiece. You can also use the side of the slot drill.

**End Mills** usually have four cutting faces but you can only use the side of the cutter to penetrate the workpiece. They cut faster than a slot drill and give a better finish.

**Uni Mills** have three cutting faces and are a compromise between the other two. I find slot drills best for home use as they are the easiest to sharpen in the home workshop.

## Holding the work

The next thing that you need is something to hold the workpiece in. A drill vice is useable to start with but once you get into some serious milling you will find that it is not rigid enough or accurate enough. This will cause you to get yourself a proper mill vice so you might as well get a swivelling one while you are at it. By this time you will also have acquired a collection of T-bolts and finger clamps or a clamp kit.

## Power feed

If your mill did not come with a power feed you may find that some jobs can become tedious. On longer cuts a power feed gives a better finish and the cutters seem to last longer as well, due to the constant feed rate. There are a number of ways to make a power feed, using such things as sewing machine motors or automotive wiper motors. If you don't have time to make one, there are several add-on units available that do the job quite well.

## Drilling in the mill

Depending on the taper in your milling machine spindle you may need some sort of sleeve to enable you to use your tapered shank drills. The sleeve should either be driven by a tang or have a draw bolt to prevent it slipping. Once you have drilled a hole you will then

want to bore it to size and this will require a boring head. If you have ever used one of these you will know how easy it can make some jobs, such as boring cylinder castings.

## Dividing head

Now that you are becoming expert with your mill you may wish to consider getting a dividing head. This will enable you to mill square ends on shorts, make your own hex head bolts, or perhaps a few gears. A dividing head usually comes with a number of dividing plates that allow you to do most things. You might as well get the tailstock unit while you are at it, just in case you need to hold a job between centres. It is also very handy to have a three jaw chuck that will fit the dividing head, and even more useful if the chucks from your lathe will fit. This will allow you to turn a shaft and then put it straight in the mill without removing it from the chuck.

## Rotary table

To complete the set of attachments you could buy yourself a rotary table but I must confess that I use my dividing head for this purpose even though it leaves a lot to be desired. There are also rotary tables available that can be stood on edge so they can be used as dividing heads, so think carefully before you commit yourself to one or the other.

## Conclusion

There are probably other bits and pieces that I have missed out on, such as cutting fluid, swarf trays, lights, angle plates, etc, but since you are probably broke or divorced by now, I will just add "don't forget to wear your safety glasses!"

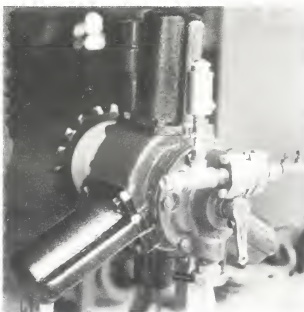


# Peter Brotherhood and the Radial Steam Engine — 2

by Dave Harper and Don Payne

*Editor's note: when I ran the article in the Nov-Dec 1996 issue somehow the sketches were omitted and it didn't make sense without them. I apologise for this error. This is a re-run of part of the previous article with sketches included plus additional information that came to light as a result of the previous article... bmc*

Further to articles on the Peter Brotherhood type three cylinder radial steam engines in AME No 51 Nov-Dec 1993, AME No 58 Jan-Feb 1995 and AME No 69 Nov-Dec 1996 considerably more information has become available by courtesy of Peter Brotherhood Ltd, Peterborough, England and their Australian Agent, GEC Alsthom Australia Ltd.



Yes, Peter Brotherhood Ltd is still alive and well and very proud of their engineering heritage from inception in 1867 by Peter Brotherhood and especially of his famous three cylinder radial steam engine which is still incorporated in the company's logo.

The company, among other things, now manufacture Steam Turbines with power outputs up to 20MW for power generation or mechanical drive applications for both land based and marine installation.

A typical example of the modern technology is shown in Photo 2.

The company's history began in 1867 when Peter Brotherhood set up an engineering and Millwrights business in London to meet the needs of the brewing industry. This included the manufacture of pumps and refrigerators.

In 1872 he patented a three-cylinder radial steam engine which won awards

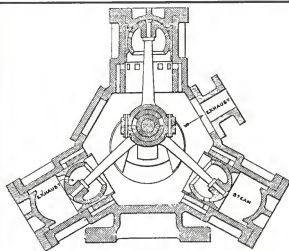


Figure 1.

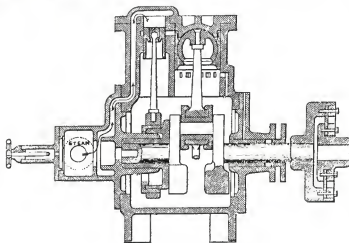


Figure 2.

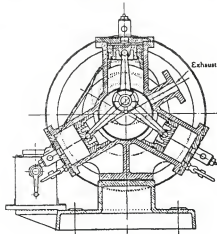
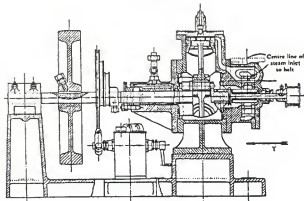
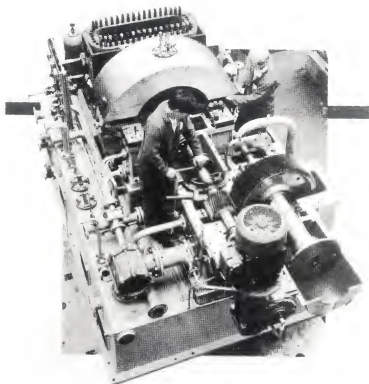


Figure 3.



12" 6" 0" 1"  
Scale of feet

Figure 4.



An example of modern Peter Brotherhood technology.

at exhibitions in Vienna, Paris and Rouen — showing that even at this early stage Peter Brotherhood was active in export markets. His product range extended to include centrifugal pumps, sawing machines, ships steering apparatus, fans, compressors and dynamo-electric machines. Many were supplied with a three cylinder steam engine as the power unit, as shown in the latter part of this article by illustrations of the January 1880 and 1895 Peter Brotherhood catalogue.

From the information already supplied have you had a go at building one of these fascinating and yet simple engines. If not, why not!

## Sketches

Drawings of the Brotherhood radial engine

appear in several books on steam engines, and seem notable for their variation! Several styles of valve gear are apparent in the drawings, so apparently various configurations were tried during the production life of these engines.

The drawings in Jamieson's *Elementary Manual of Steam and Steam Engines* (1906) (figures 1 and 2) show the piston valves and spherical big ends with auxiliary steam ports in the pistons. The exhaust ports in the cylinder walls must surely be one of the earliest

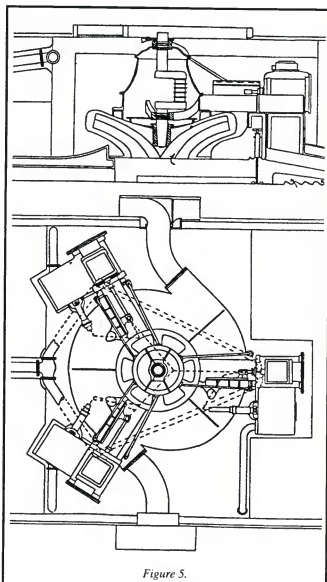


Figure 5.

examples of the uniflow principle? The design is dated 1873. A centrifugal governor in-line with the shaft operated the throttle. The author notes that many of these engines have been built not only for running dynamos and fans but also for use with compressed air. As steam

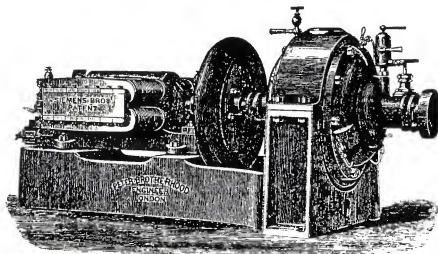


Figure 6. Brother hood's patent Three-Cylinder engine direct driving Siemens's medium-size dynamo-electric machine. Speed: 700 rev/min.

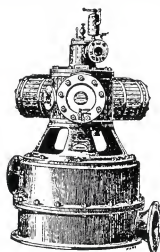
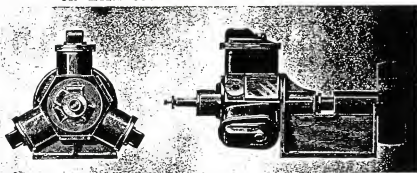


Figure 7. Patent Helical pump and direct-acting patent three-cylinder engine.

PETER BROTHERHOOD'S

# PATENT 3-CYLINDER FIXED ENGINES,

WITH OR WITHOUT SENSITIVE GOVERNORS,  
OR WITH REVERSING GEAR, WITH PULLEY FOR DRIVING BY BELTING,  
OR WITH COUPLING FOR DIRECT DRIVING.



Indicated H.P. at a piston speed of 400 ft. per minute, with a mean effective pressure of 40 lbs. per square inch . . . . .	2'8	3'1	9'1	14'2	20'5	36'3
Diameter of cylinders . . . . .	2 1/4"	3"	4"	5"	6"	8"
Length of stroke . . . . .	3"	4"	4"	5"	6"	8"
Number of revolutions corresponding with a piston speed of 400 ft. per minute	800	600	600	480	400	300

Figure 8.

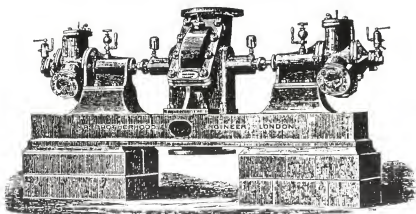


Figure 9. Appold's patent centrifugal pump fitted with direct acting three-cylinder engine.

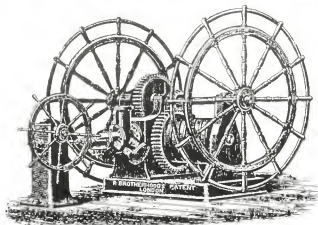


Figure 10. Brotherhood's patent three-cylinder steam steering apparatus

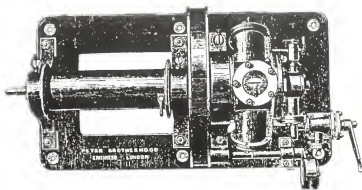


Figure 11. Brotherhood's patent three-cylinder steam-crab or hoist.

engines they are being entirely displaced by the double-acting high-speed engine. This would explain Brotherhood going over to producing conventional engines for the lucrative generator market.

In Dickinson's *A Short History of the Steam Engine* (1963), are figures 3 and 4 showing the first engine displayed in 1872.

Although the text states that steam is distributed by balanced piston valves actuated from the crank pin, the diagram shows more of a radial valve arrangement. We'd love to hear from anyone who could throw more light on this matter!

Dickinson goes on to state that the engine is made in many sizes from 2 1/2" bore by 2" stroke, giving 1 1/4 bhp at 1000rpm, up to 7" bore x 6" stroke, 55 bhp at 500rpm.

Interestingly, in *A Short History of Naval and Marine Engineering* by E. C. Smith (1937) I found details of HMS *Waterwitch* built to the design of J. and M. W. Ruthven of Edinburgh in 1866. This was one of several experimental vessels built to try boat propulsion by centrifugal impeller and water jets.

*Waterwitch* was a gunboat 162ft long, 32ft beam and 1161 tons displacement. The power plant consisted of a three cylinder engine with an impeller mounted directly onto the crankshaft. Figure 5 shows the arrangement.

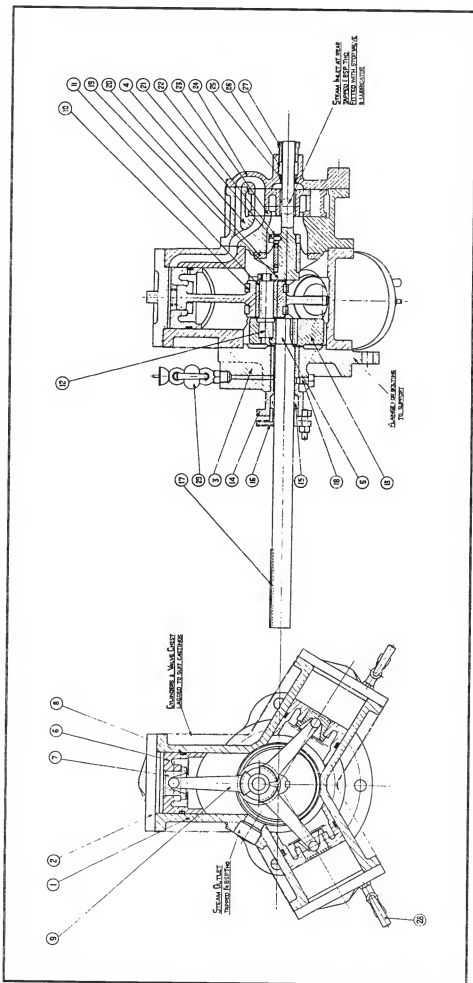
The impeller weighed 8 tons and revolved in a chamber of 19ft diameter. Water was drawn in through a large number of openings in the bottom of the hull and discharged through two nozzles 24" by 18" on each side of the vessel, fitted just above the waterline. By sluice valves the water could be directed either ahead or astern.

With the engines giving 777 indicated horsepower 9.3 knots was achieved in calm water but only 5 to 6 knots in the open sea.

The mind boggles at the gyroscopic forces generated by an 8 ton impeller being tossed around in a rough sea! The whole system proved too inefficient and was abandoned. However, it does pre-date Brotherhood's patents, and one wonders if he was aware of these experiments. Being in the marine engineering business, it would seem highly likely.

## Versatility of Uses

The vast range of engines is shown in the 1880 and 1895 catalogue and it appears that any equipment now driven by electric motor would have been driven last century by a Pe-



ter Brotherhood three cylinder radial engine.

It is generally accepted that the Willans high-speed steam engine invented in 1882 enabled engine and dynamo to be directly coupled, but as clearly shown in Fig. 6 of 1880 it indicates that "The Three-Cylinder" Engine has for some years past been most successfully applied to driving dynamo-electric machines direct".

It is interesting to note that in this illustration the engine is shown in a circular shroud and its three cylinders are not evident.

According to *Brotherhoods, Engineers* by Sydney A Leleux the first application of a Brotherhood engine driving a dynamo directly was on the French warship *Richelieu* in 1875. The same type of engine was also used for driving her centrifugal pumps direct.

In Fig 7 the three cylinders are clearly shown and in this case are wood lagged.

In Fig 8 a fixed engine for belt drive is shown in ranges from 2.8 HP to 36.3 HP and the compactness of the engine is shown. This is from the 1895 catalogue.

Fig. 9 shows two engines applied to a centrifugal pump and in this case no lagging is apparent.

In Fig 10 showing a ships steering apparatus the engine appears to be swamped by the equipment it is driving.

An interesting subject for a model is shown in Fig 11 depicting a very compact steam crab or hoist. This would appear to be a reversing engine but how this is achieved in these engines leaves food for thought.

Hopefully more information may be obtained from Peter Brotherhood Ltd at a later date.

The extract from the 1880 catalogue in Fig 12 gives some interesting information regarding lubrication in earlier days and also indicates that the engine could be arranged for cut-off at any degree of expansion and a reversing gear could be readily applied.

The Sectional Arrangement drawing (Fig 13) should give you, with all the other information now published, sufficient information to go ahead and design your own version of this fascinating engine. Give it a go!

## Other Products

Peter Brotherhood produced the "Paragon" steam pump and also the "Improved Pump" for heavier duty as shown in Fig 14 and this would make up to be a very attractive model.

Also in the 1890 catalogue were some examples of very attractive two cylinder double acting open high speed engines and compound engines of conventional design from 5" bore x 10" stroke to 13" bore x 10" stroke.

In 1905 a Brotherhood car was produced by Brotherhood-Crocker Motors Ltd. The car, of advanced design, was fitted with a 3.9 litre engine developing 20 HP at 900 RPM and drove the wheels through a four speed gear box and chains. A 40HP model was introduced for 1906.

Brotherhoods ceased car manufacture after 1906 but subsequent development was undertaken by Sheffield-Simplex of Tinsley, Sheffield.

# Maritime Matters



with Leigh Adams

They say that when it rains it pours and that's what happened in November. Every Club, Society and Association decided this was the month to hold their annual meeting, show or regatta. Well, I did my best to attend as many as possible and I will attempt to give each one a breakdown on where it was and what happened on the day or weekend.

## Port Macquarie model show

Not quite in November, but an interesting weekend. This show organised in conjunction with Port Macquarie RSL saw a static display of model boats from enthusiasts from Sydney to Brisbane. Held in the aptly named HMAS *Rushcutter* Room, models on display included period ships, scale warships, merchant ships and scale yachts. The variety and high quality of workmanship was appreciated by the 5000 strong crowd over the weekend. Some modellers tried to run in the canal adjacent to the club, but the consistent rain made it quite miserable. This is the first time this event has been run and from the response, I'm sure this will become an annual event on the model boat scene.

## Sydney Society of Model Engineers open day

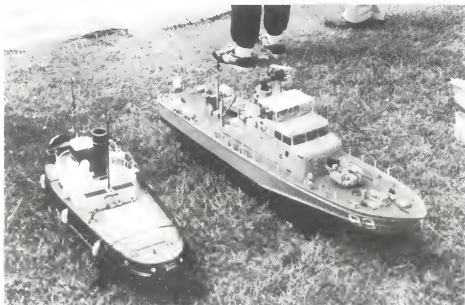
Held on the weekend of 26 and 27 October, I was only able to attend on the Sunday. Overcast skies and light showers greeted us as we drove out to Luddenham, but long breaks in weather gave us time to have a look around the complex, enjoy the sights and have plenty of rides on the trains, which my six year old

says was the best bit. The society has been working feverishly on the lake and really is a credit to them. The facilities are top rate. The visitors and model boaters enjoyed the day. A variety of vessels took to the water including electric, steam and some super quick glowies which always excite the onlookers. This is a great model boat venue and I look forward to another invitation to run at Luddenham.

## Canberra annual regatta

Just a short drive down the road and we

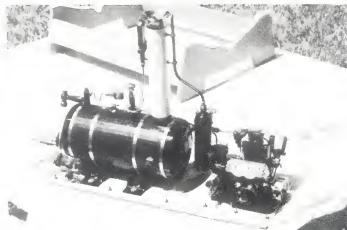
arrived at the nation's capital. The ACT Model Boat Club was having their annual regatta, but this was a special one as this was Number 21! Twenty-one years of modelling is a milestone in any club's books. As with previous regattas, organisation was outstanding with the club catering for all the modellers' needs. The Saturday night run was well attended and the illuminated ships made a terrific sight. In standard Canberra weather, the cool breeze set in around 9 p.m., but the hardy continued and made the best of the time. Sunday morning brought us mainly blue skies and the sun was cutting into the Blockout!™ at around 10 a.m. Everybody came well prepared and the grass area soon looked like a camping area, dotted with tents, pergolas and even some large trailers. A quick count around midday gave me a total of 60 model boats. The waterways and frequency board were in constant use all day, except when the hot dogs were ready for lunch. It was good to catch up with some modellers we only see a couple of times a year. Traffic on the water was quite intense throughout the entire afternoon and in true ACT tradition the weather



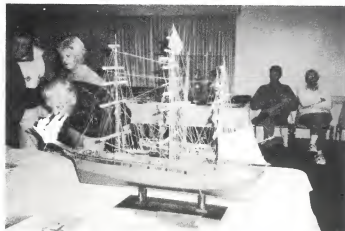
Canberra: Dave Coupers Tug *Aldinga* (left) and Jack Reaney's *HMAS Advance*.



SSME: Boat lake and wharf.  
Warren Reaney's 7ft paddle wheeler in foreground



Canberra: V4 Cheddar steam plant ready for installation.



Port Macquarie: *Cutty Sark* on display.



Port Macquarie: Noel Chippindale (L) and Frank Browne (R) standing behind the *Franz W* and *HMAS Kurlaw*.

closed in toward the end and had modellers packing. Thanks to President Peter Cole and his members for a great weekend.

### Newcastle anniversary regatta

This regatta normally held on the Australia Day weekend was transferred to 1 and 2 February, this didn't really effect the crowds. The public in Newcastle always supports this event held in conjunction with the Maritime Museum Expo. Modellers flocked to what is one of the best man-made ponds in NSW, approximately 500mm deep with a concrete bottom, running, retrieving and viewing models (especially submarines) at this venue is excellent. The Newcastle model boat club always caters well for fellow modellers with marquees, tables and all the standard facilities.

Activity on the water was very intense, with models moored in the middle of the pond and vessels travelling in a clockwise direction, there was plenty for the onlookers to view and ask questions about. I'm sure there will be some new members at the next Newcastle general meeting. Another great day was had by all, well done NMBC.

### Melbourne Model Boat Club Inc.

This is a relatively new club with a small membership and, like most clubs, hoping to expand. Models in the club at present range from medium to large sizes. Sail, battery electric and steam propulsion mediums are represented. The club doesn't have any internal

combustion powered craft. Because of the size of some of the models they are usually transported in purpose-built trailers. One of our trailers is shown at the ACT Regatta in AME, issue 65, on page 28.

These trailers are also used as club rooms. They are fitted out with cooking and toilet facilities as well as facilities to repair broken down models.

The club is happy to display models at community festivals and City organised events. Besides the boats, the club also has a selection of radio controlled trucks, cars and tanks.

Contact Geoffrey Clarence on 015 094 236 for more details.

## Coming Events

17, 18 May

### Gisborne Vintage Engine & Steam Rally, Gisborne Steam Park

Open to public 10am to 4pm. Adults \$5, pensioners \$3 children under 16 free. Camp sites avail. Fri to Sun.

Features steam engines, vintage vehicles and machinery, models, train rides. Hot food and drinks avail. Contact Jeff Shepherd (03) 5428 6573 or Rod Roberts (03) 9336 3406

17, 18 May

### Sweet Pea and Blowfly Invitation Run

Coincides with annual Kindred Society Run which has been extended due to popularity. Local and interstate visitors bring your 3½" and 5" g locos. Tea, coffee and friendly hospitality provided. Inquiries (03) 9553 4037 (SLSV) or (03) 9580 1408 (Ken Roife)

22 to 25 May

### Hare & Forbes, George St. Parramatta, NSW, 4th annual sale and model engineering display

See metal and wood turning demonstrations by experienced operators. Rotary club barbecue. Hornsby and District Model Engineers Society members' display of projects. Many great tool and machine bargains! See the ad on page 59 for more details.

31 May

### AALS NSW Interclub Run at Lake Macquarie LSLS

Everyone is welcome to our track off Velinda St. Edgeworth. Running on Sunday (1 June) is welcome. Contact Joe Huntley (049) 54 0358

7 to 9 June

### Hot-Pot Run — Wollongong

You are all invited to a winter run over the Queens Birthday weekend at the Illawarra Live Steamer's track, Virginia St. North Wollongong. Condition of entry: two cans of soup! Contact: Ian Kirby (042) 29 2918 or Warwick Aston: (02) 9520 8186. (2½", 3½" and 5" g. elevated, 5" g ground level track). See the ad on page 7.

7, 8 June

### 34th Echuca Steam, Horse & Vintage Rally

Rotary Park, Northern Highway, Echuca. Inquiries: (03) 5480 1115

4, 5, 6 July

### Montreal Live Steamers, Quebec, Canada. IBSL Commemorative Meet

To be held in the Canadian National Railway recreation grounds in Lachine, Quebec. Track gauges available 3½", 4¾", 5" elevated and 7¼" ground level. Contact Montreal Live Steamers Corp., PO Box 451, Pointe Claire, Quebec, Canada H9R 4S6.

5, 6 July

### Bendigo National Exhibition

The Bendigo Society of Model Engineers are holding a national exhibition at the

Leisure Centre, Kangaroo Flat. Organised by Events Bendigo. Further information from:

Peter Robinson (03) 5447 8667 or Events Bendigo, Stephen Cole, Phone: (03) 5444 4144, Fax: (03) 5443 4268.

23 August

### AALS NSW Interclub Run at Illawarra Live Steamers. Virginia St. North Wollongong.

11, 12 October

### 7¼ inch rail/traction engine weekend, Berry, NSW South Coast

Pictureque Berry Railway has 2 km of 7¼ inch gauge track, and meandering pathways for traction engines. See the ad on page 6. Inquiries: Les Boyd on (044) 64 1304.

6 December

### SLSLs Christmas run at West Ryde. Anthony Road, West Ryde NSW.

8 to 12 January 1998

### International Model Engineering Expo, Tauranga NZ

Model exhibition, hobby displays, working demos, road vehicles, railways 2½", 3½", 5" and 7¼" gauges.

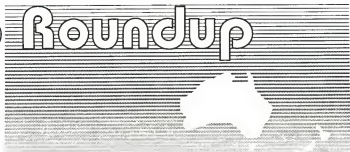
Registration forms now available from: Expo 98 Secretary, 326A Devonport Road, Tauranga NZ

10 to 13 April 1998

### AALS Convention

Castledare Miniature Railway, Wilson, WA. Contact the club on (09) 356 2290

# Club Roundup



compiled by David Proctor

## Durban South Africa

The air/oil conversion cylinder and controls for the hydraulic lifting turntable have been made and are now in place. The device uses air pressure in the 4-7 bar range to push oil into the turntable cylinder and vary the height of the ram. The oil line is valved to eliminate sponginess in the controls. Construction of new two and three light signal posts is under way.

Some time ago the club took the decision to build a 7 1/4" gauge locomotive. After considering various options members have decided on a 2-6-2T with South African Railways characteristics, which will be known as *The Highwayman*. Construction is progressing well with the rolling chassis already under a track to prove it and Walschaerts valve gear and boiler have been made.

Club members are already gearing up for the National Steam Meet 1998 which they will be hosting over the Easter Weekend.

## Durban Society of Model Engineers

**Location:** Kellaway Hall, Hinton Grove, Virginia

**Public Running:** 2nd Sunday

## Gisborne Vic

Now that the Macedon Ranges & District Motor Club are moving to Steam Park, the plans of both groups activities have been combined into one management plan. The result is a busy work schedule for some time to come, which includes the construction of a 2ft gauge railway and passenger carriage for same, workshop/storage building and re-fencing the 7 1/4" railway, public barbecue and gazebo along with the construction of various buildings, just for starters.

Work continues on the portable track and a site for it has been selected in the Lions Park. The current objective is to have the track up and running by the first market day in Spring this year.

In the past the Tractor Pull has been incorporated into the May Rally, but this year it will be held separately towards the end of the year. This is due to the expected shortage of space with the large number of McDonald exhibits.

## The Gisborne Vintage Machinery Society Inc.

**Location:** Steam Park, Webb Cres, New Gisborne

**Public running:** 1st Sunday

## Maryborough Qld

The well known engineering firm of Walkers Ltd staged an open day, whereby they opened their works to the public. MELSA members had B15 loco, QR No.299, in steam for the occasion. This loco which carries Walkers' builder's no.1 contrasted with Walkers' latest product, the high speed Tilt Train for Queensland Rail which was also on display. Club members have also had a private inspection of the carriage works and the Tilt Train.

At the AGM dinner, retiring President David Proctor was replaced by Bob Lisle. Graham Chadbone is the new Vice President while all other positions remain unchanged.

## Model Engineers & Live Steamers Assoc

**Location:** Queens Park, Maryborough

**Public Running:** Last Sunday

## Tauranga NZ

Contractors have completed construction of the bridge. The track bed has been de-turfed, a re-inforced concrete foundation of 22 metres has been cast in position for the tunnel. Bridge abutments and inclines are complete and track bed is currently being cast. Expo is only about nine months away now so members know this will be one of their busiest years ever.

## Tauranga Model Marine & Engineering Club

**Location:** Memorial Park, Tauranga

**Public Running:** Every Sunday

## Eltham Vic

The Meadmore Junction 'A' signal box is no more! Resident rodents had eaten the insulation off the signalling cables and termites found the building itself to be quite tasty. A new signal box building was constructed some two years ago and in the intervening period it has gradually been fitted out with cabling, interlocking and various electronics.

A special meeting prior to Christmas reviewed all outstanding projects. Those which have not yet commenced have been 'canned' and new priorities set. These include a pedestrian bridge at the departure end of Diamond Valley Station, a new station platform on No.1 Road (with roof), track duplication be-

tween Meadmore Junction and Diamond Valley, which includes two bridges, and some landscaping projects.

## Diamond Valley Railway Inc

**Location:** Eltham Lower Park, Main Road, Eltham

**Public Running:** Every Sunday

## West Ryde NSW

SLSLs are planning a 49th anniversary celebration for members in July, which is 'a practice for the Big event next year'. The Christmas run this year will be on Saturday 6 December. Last year's run was very successful with 25 locos present and visitors from many parts of the state.

Work has been under way for some weeks to provide access direct from the unloading hoist to the elevated roundhouse. The hoist will swing through ninety degrees to connect with a removable track section connecting in turn with a specially modified roundhouse road. This will ease congestion in the ground level depot making it easier for large locos using the elevated track to access the elevated roundhouse.

## Sydney Live Steam Locomotive Society

**Location:** Anthony Road, West Ryde

**Public Running:** 3rd Sunday

## Moorabbin Vic

Preparations are in hand for the "Great Sweet Pea and Blowfly Rally" on 17 and 18 May (see Coming Events for contact details).

Following the recent AGM a few changes to management have taken place. President: Steve Gaal; Vice-President: Ron O'Shanessy; Secretary: Graham Plaskett; Treasurer: Margaret Shanks. Congratulations to the new officers. Ken Tinkler is having a well earned rest from committee activities after serving from 1971 to 1996 in various posts.

## The Steam Locomotive Society of Victoria Inc.

**Location:** 128 Rowans Rd. Moorabbin.

**Public Running:** 1st Sunday.

## Club Roundup contributions

AME is pleased to receive club newsletters for consideration in this section. Newsletters are often a good source of articles, which we appreciate all the more, but most of all they help us keep in touch.

It is often difficult to decide what to publish and what to leave out. And the task of selecting material for a wider audience takes a lot of time. Also, there is always the risk that AME will publish something that the club considers sensitive. Please help by sending a "press release" page with your newsletter, or highlight the items you think we could use. We'll give first preference to clubs that help us out this way.

bmc

# Tracks 'n' Trees



## For the garden railway enthusiast

### Problems with Metho Advice from Michael Ragg

At the 1994 Bowral steam up I had a problem with the fire going out on my engine despite having adequate fuel. The flame would gradually diminish in size over a period of five minutes until it extinguished. The top of the wick was dry while its base was quite wet with metho. I changed the wicks but the same thing happened. After much investigating at home discovered that the problem was caused by old meths in which there was a fine green slime held in suspension. As the fuel was consumed, this slime was deposited on the base of the wick, clogging it and destroying the capillary action.

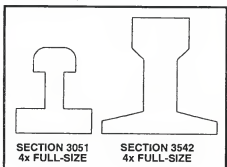
New metho and clean wicks fixed the problem.

### Perway by Gary Warton

A common question asked is: where do you get the track for the garden railway? 32mm and 45 mm gauges are commercially available from most model railway hobby suppliers. However, if you wish to build your own, the following information should point you in the right direction. At least it may help you decide between the two options of providing the permanent way for your garden empire.

#### Rails

Code 319 brass rail is commercially available — although only in large quantities — from Extruded Metals Pty Ltd at Moorebank in Sydney, ph 9601 2033 quote section 3051. Minimum quantity is 100 kgs. That's 230 pieces 3.66m long (840 metres). The cost in mid 1995 was \$810. That may be a bit much for one person, but spread over three or four the cost is quite reasonable. It works out at \$0.96 per metre. The rail is okay for flanges up to 2mm deep.



If you are after a larger section code 296 rail, almost the same as LGB rail then quote section 3542. Same minimum quantity but fewer pieces 140 or 512 metres) due to the greater weight per length. The cost is on a per kilo basis. 3051 gives a good representation for light weight narrow gauge track while 3542 is rather heavy, almost mainline standard.

If you only require a small quantity this can be obtained from Geoff Green in Melbourne ((03) 5974 3670) for \$3.50 per 1.8 metre length.

Steel rail, code 215, is available in the United States from two sources, Micro Engineering, Phone 0011-1-314-349-1112 and Llagas Creek Railways, Phone 0011-1-408-779-4391

#### Rail spikes

Australian made steel spikes are also available from Geoff Green. Or from Micro Engineering in the United States, you can get chemically blackened steel spikes. These are 1/2" long with a squared offset head. Cost (Feb '94 list) is: item 30-101 US\$5.95 for 500 or item 30-102 US\$80.50 for 7500.

#### Fishplates - Joiners

Geoff Green can supply excellent brass fishplates for the section 3051 rail at \$0.50 each or make your own with a 12mm strip of brass, a small hammer, a steel vice and a section of rail. Cut the brass to about 25mm long and use the base of the rail as a former to hammer the brass to shape. A lot of work when such good ones are available from Geoff, but if your budget is really limited make your own.

#### Sleepers

This is where you get even more choice. Timber selection is critical for the durability of your railway. In my area termites are a big problem and to test for the best timber I stuck pieces of pine (untreated), oregon, redwood and western red cedar into a termite nest. The best out of the samples was the cedar followed by the redwood. The pine and the oregon did not stand a chance. CCA treated pine would also have resisted termite attack but to saw to a suitable size would produce sawdust that can kill if it gets into your body and is also unfriendly to the environment. Western red cedar also produces a dust that is possibly harmful but with the correct face mask and filter, dust inhalation can be minimised. The

cedar is a very durable timber, even more so if regularly treated with a wood preserver, and is easy to drive spikes into without predrilling. Jarrah is another durable wood but the sleepers would require predrilling to accept spikes. You could also try Pacific Maple as long as it was regularly treated with a wood preserver and was placed on a free draining base material. For any other timbers try making up a short length of track and place it outside for testing against the elements. Now that you have selected your timber all you need to do is to cut to your preferred sleeper size. This is quite easy if you can get access to a circular saw bench as an hours work will see enough sleepers produced for a fair sized railway.

#### Ballast

What you need here is a free draining material, preferably of scale appearance. My own preference is crushed granite available as Granitgard - non-toxic termite barrier, phone 008 032549 (toll free). A 25 kg bag cost me \$4 in 1995. This material is very close to scale but can be dislodged by heavy rain, perhaps mixing it with a little dry cement would help bind it together. Try your local garden or landscape supplier for other materials.

That takes care of the basics materials for your permanent way.

### Gardening Tip by Gary Warton

Have you tried some of the thymes as ground covers? *Thymus serpyllum minimus* gives a good cover and seems to grow anywhere. Woolly Thyme (*Thymus pseudolanuginosus*) is another good plant too, provided that it has good drainage.

A plant that I have tried but found to be very invasive among other ground covers is *Pratia pedunculata*. It gives great cover with tiny white flowers and is fairly hardy. *Pratia puberula* has blue flowers and does not seem to be quite as invasive. *Cotula perpusilla* gives a good representation of miniature bracken fern and has good cover in sun or shade once it becomes established. A good plant for trees for the miniature landscape is *Hebe*. My example has near-scale leaves and a compact round form.

### Minimum boiler size

The article *A Butane Burner and Boiler* in the previous issue, on page 28, made a statement about the minimum size of a boiler to come under the AMBSC Copper Boiler Code. The statement was not exactly correct.

AMBSC has advised AME that the minimum size covered by the Code is 50mm diameter.

To be exempt from the Code: the boiler must be less than 50mm (1.968") diameter and less than 1 litre water capacity and less than 250kPa (36.26psi) pressure. Note that all three of the criteria must be satisfied to be exempt from the AMBSC Code. AME apologises for any inconvenience caused... bmc

# The Big V

## A 1½" scale WAGR heavy 2-8-2

by Warwick Allison

*Photos supplied by Warwick Allison, drawings for publication by Neil Graham*

After a foray into building several 3½" gauge locomotives which included a *Titfield Thunderbolt*, *Tich* and a *Maisie* to name some, I started thinking of building a useful sized locomotive which would haul the six car passenger sets used for public haulage at my home club at West Ryde out of Sydney. The experience gained from these smaller locomotives, especially the *Maisie* and in particular the boiler design, I believe has stood me in good stead for later.

### Why the V?

It's now over 14 years ago and it took 10 years to build! It took my fancy as being a fairly large engine for 5" gauge, the prototype being a 3'6" gauge Western Australian 2-8-2, being fairly straightforward construction with a nearly all square valve gear layout and a frame arrangement that lent itself to an all welded construction.

The scale chosen was 1½" to the foot, which offered several advantages. It gave additional clearance between the leading wheels and crosshead, a normally tight spot at the best of times. It produced a slightly larger engine than if the scale was based exactly on 5" gauge, and best of all, it meant that all the full size dimensions need only be divided by 8! Very easy scaling calculations, mostly mental arithmetic, which allowed me to work straight from the full-size drawings.

### Scaling, or is it vice versa?

Thinking laterally, basing the scale on the track gauge does not have a lot going for it. In full size practice the physical size of the locomotive was based on the structure gauge more than anything else. For equivalent structure gauges (and for that read engine size) they produced engines which varied from metre gauge to over 5'3", which says to me that the

number one choice is convenience of scale and then adjust the frames to suit the gauge! Extreme examples of the above can be easily found — the rather restrictive loading gauge of the former New Zealand Railways and the very generous loading gauge of the South African Railways (both on 3'6") which is more akin to the VR structure gauge which sits on 5'3".

### Wheels and frames

Outline drawings for the frames, coupling and connecting rods were produced and these components were oxy-profile cut out. Frames are ¼" steel plate.

The wheels are of a distinctive type so patterns were made for these. Being a member of a club which has a long history and depth of model engineering knowledge has certainly made construction easier for me. One member kindly duplicated the axle box patterns in casting resin to reduce the number of foundry mould boxes to be poured while another supplied steel tyres which were fitted two years after the locomotive was put in service. More on this later. I arranged to get the castings through still another member which saved time dealing with foundries. It is hard to organize these things in weekday working hours.

Axleboxes are of plain cast iron. These are fitted with felt oil pads which are lubricated via a grease nipple in the bottom of the box.



*This imposing view of V.1224 shows the generous diameter of the smokebox to advantage. Note the chopper type coupler. A drawing is provided on the following pages*

Photo: Neil Graham

### The cylinders

I originally thought of using cylinders from another engine and actually had iron castings obtained, but as time passed I became less satisfied with these as the V's were of a very distinctive shape and consequently I made patterns and core boxes. I simplified the pattern to avoid awkward cores. This had one effect in reducing the area of the exhaust steam passages. To ensure this area was problem free I decided it would be feasible to make the piston valves hollow. This allows the exhaust to escape through passages at both ends of the piston valve. The piston valves are 1½" diameter and fitted with Cliplok type rings. Ordinary 2½" diameter rings are fitted to the pistons.

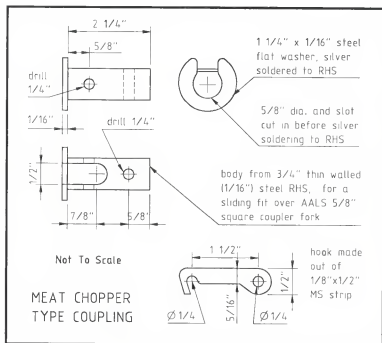
The cylinders are each provided with three drain valves of the steam operated teflon diaphragm type. The middle valve drains the steam chest. These were simple and quick to make and are very reliable in service and are operated from a small 3-way taper cock in the cab.

### Frames and motion layout

I did my own frame layout drawings to ensure that cylinders, wheels, crank-



*V.1224 drifts downhill with a short goods consist on the inner main at SLSLS West Ryde*



pins etc. all were in the correct relative position, but used the full size WAGR drawings for most other components.

The return cranks are fitted with sintered spherical bearings for long life, all other valve gear components being bronze bushed.

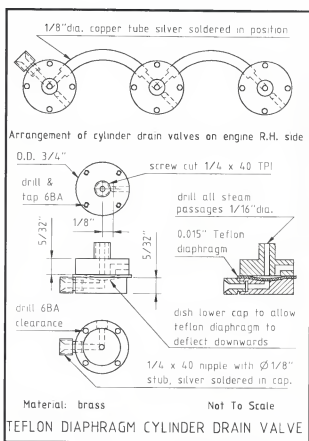
### The smokebox

The smoke-box is 95 1/2 inch outside diameter rolled from 10g steel sheet courtesy of a fellow club member. A machined ring fits between the boiler and the smokebox and this was the only component I couldn't machine myself on my Myford Super 7; the outside diameter was okay as it could be held on the

inside, but my chuck could not stretch far enough to hold the outside so I could bore it to a neat fit on the boiler, so another club member kindly performed this task.

### The boiler

The boiler is steel and of the Briggs type. I wanted a combustion chamber to cut down what would have been excessive tube length. This was done by extending the firebox and providing a dry curved cover to the bottom (as an extension to the barrel). This and the dry



firebox sides are 1/4 inch steel plate and are clamped to the boiler by long U bolts over the top. The water wall headers are of 3/4 inch 16 gauge copper tube and the verticals are 1/2 inch 16 gauge tube. Five verticals are fitted on each side. Each water wall is independent and the front is attached to a 3/8 inch BSP teflon ball valve for the blowdown which is piped away between the frames. One of these is fitted with a snap on hose connector. It takes only seconds to connect up a garden hose and open the blowdown valve to fill the boiler with water. A fusible plug is fitted. The dome is a 1 1/2 inch BSP threaded fitting welded on.

The firebox crown is supported by a single rod stay about 3/4 inch diameter. I did all the fabrication of plates myself but an engineering company in western Sydney did the certified welding. A twin hopper ashpan was fabricated and fitted as per prototype.

The three safety valves are of 5/16 inch bore, pressed to 100psi, and are of the ball pop type and seem to be able to easily handle their job. Two water gauges are fitted as per prototype. A standard spearhead type superheater is provided. Eight spearheads of 3/8 inch tube are fitted into the four flues. This is a similar arrangement to LBSC's *Maisie* design and is one of the features that made this design so spectacular. In fact the whole boiler is like a scaled up *Maisie*!

Wendy, my wife, did a lot of the delivery and pickup of parts over many weeks, for the boiler and other bits and pieces. This was really appreciated when I wanted to move on to the next part. I was thus never short of the necessary raw material with a resultant long wait to my next day off.



Its 1992 and V.1224 is not long out of shops as a happy builder eases a passenger set out of the West Ryde car sheds in preparation for the afternoon roster. Four hours hauling passengers.

Photo: John Lyons

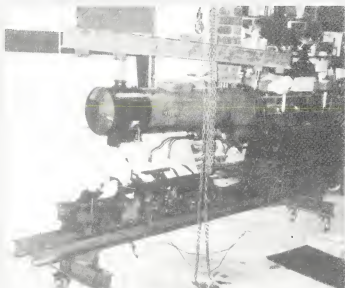
# Handling those Big Locomotives

by Warwick Allison

Readers may be interested in knowing how I work on and store the big V.

The engine lives on a mobile stand. This is fitted with fixed wheels at one end, and castors at the other. The rails are 75mm channel and the whole is arranged the same height as my trailer to facilitate rolling the locomotive on and off across a short bridging piece. I wanted to be able to roll the engine along the stand for at least a full revolution of the wheels (I made it one and a half) without it falling off the end. As the tender has a hand brake I did not consider it necessary to fit the stand with buffers or similar, but these would be a wise addition if you have any little helpers around! The castors are well to the end to allow easy access to the underneath of the locomotive.

I purchased a chain block to do the heavy lifting. As I was blessed with a 6" universal beam across the middle of the garage ceiling, I made a runner to allow the chain block to be manoeuvred back and forth. This was made up of 1/4" plate (actually the

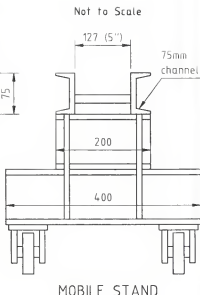
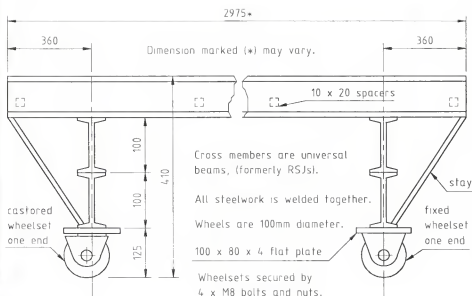
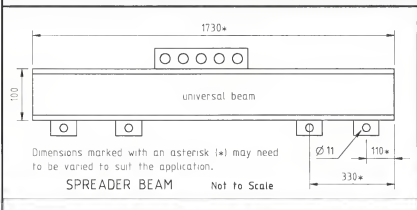


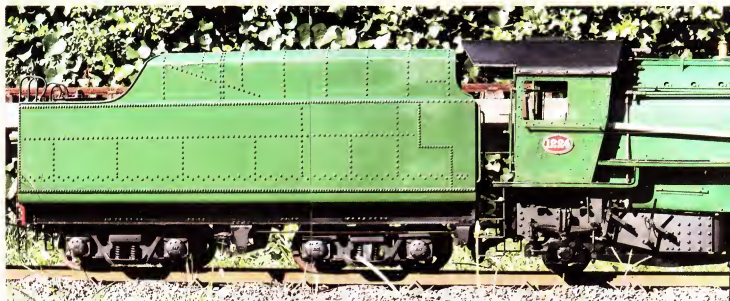
cut off from my Briggs boiler dry throat plate) and used some odd sized metric ball races I picked up cheap at a car swap meet.

A 100 mm U-Beam was made into a spreader beam by welding on some steel blocks with holes to suit suitably sized shackles. A variety of holes allows for the correct balance point to be obtained. The beam is designed to lift either the boiler (with smoke box) alone or the whole locomotive and lifting positions are provided for both at the appropriate centres.

The engine has a pair of lifting holes (prototypical) in the frames ahead of the smoke box. The rear end is lifted by a special draw bar with a lifting ring that fits neatly in the drag beam coupling pocket.

In addition to the above I have a small trolley on castors which has proved very useful for placing the boiler on and moving it around, and a work bench with wheels that I can locate under the roof beam to lower the engine on to it and then move it back to the wall, to allow me to still fit the car in!





### Braking

Compensated brake gear on the engine is steam operated, while a brake vacuum ejector is fitted for the vacuum brakes on the tender and train. The vacuum line runs right through the engine to the front buffer beam for tender first working, or double heading.

### Lubrication

Two mechanical lubricators of the LBSC oscillating cylinder type are fitted, with non-return roller clutches instead of ratchet gear which I find awkward to make right and keep maintained. The lubricators are driven from the expansion link trunnions and both feed into a common manifold before splitting and feeding into the steam pipes just above the steam chests. This arrangement ensures positive lubrication to both cylinders even with only one lubricator working.

### Still to come

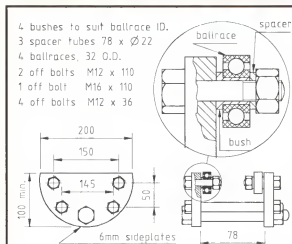
The prototype had steam powered reverse, but this has not been fitted at this stage, nor has the turbo generator, although a steam valve has been installed for this.

### Electrics

A fellow clubby provided me with some teflon insulated wire for the electricals. These consisting of marker lights, cab lights and headlight operated from a 6 volt motorbike battery and voltage regulator in the tender (until the turbogenerator is created). The voltage regulator ensures constant volts so that as more lights are switched on, all retain a constant brilliance. Standard 2.4 volt torch globes are used. A small switch panel is mounted in the cab. The headlight is of the domed type (like a NSWGR 60 class) and this posed a problem until I discovered that a K-Mart ice cream scoop was just the right size! At \$1.49 it was the right price too!

### Boiler feeds

A 25 oz and a 60 oz injector has been fitted for boiler feeds. Also, a pair of single acting axle pumps were fitted for boiler feed which makes driving easy, as the water is maintained at a (relatively) constant level. This reduces



After assembly, check that the throat of the hook will fit, otherwise machine spacer tubes as required.

#### ROOF BEAM RUNNER

to suit a 75mm wide beam

Not to Scale

### Handling those Big Locomotives

*An essential part of moving heavy parts of or a complete locomotive around the workshop is the provision of a roof beam or two and beam runners to allow such a shift after say lifting the boiler off the locomotive. On the left is a drawing of a typical runner which can be fabricated in the home workshop.*



any fears one sometimes has when a new driver is put into the seat.

All four methods of boiler feed work in completely separate circuits to ensure maximum reliability, although this means there are seven connections (none under pressure) between the engine and tender (two for injector water, two for axle pump supply, two for axle pump bypass returns, and one vacuum braking line).

### The tender

The tender is of fully welded construction of 10 gauge steel, which consequently needs no internal bracing etc. No baffles are fitted. Even though the drivers seat on the tender is quite high up compared to other 5" gauge engines, the tender rides very smoothly with exceptional stability.

Thousands of rivets were fitted to the tender. I found that after preparing the plates (i.e. marking out and drilling all the holes) I could fill up those holes with rivets at the rate of 100/hour. An hour and a half of this was enough to send me to bed with a headache!

To avoid awkward plumbing all the pipe runs under the tender were done in plastic tube from the sump to the engine/tender connections at the front. This only required a couple of brackets to hold it in position and avoided awkward bending and fitting of copper pipes. 6mm flexible tube was used which seems to be a nice firm fit over 1/4" tube. Is this one case where metric sizes work in our favour?

Front and rear couplings are of the plain fork type. Imitation "meat choppers" are slipped over these for light engine movements to protect the tender ladders and engine cow-catcher and because they look good.

### Ease of driving

For ease of driving the reversing wheel and vacuum brake valve have been extended through the rear of the cab.

As well as a 1" diameter pressure gauge, steam chest pressure and vacuum gauges are fitted.

### Livery

I wrote to Westrail and enquired what colour was used on the V's. I have seen this described variously as Larch green or Hawthorn green. Westrail kindly advised that they specified Australian Standard AS381 - Colour number 267 Traffic Green. I had some mixed to this colour, but as it was ordinary house paint I didn't consider it good enough to take the heat or handling. However Rustguard® Forest Green is virtually identical. This had a slightly higher temperature rating and did not need a primer, so I tried this. This went on reasonably well (especially seeing that painting is the hardest part!) but the Briggs dry firebox walls still caused discolouration with the heat despite insulation. The final solution may be an overall coat of black paint!

If anyone is interested, the Traffic Green is now on the Sydney Live Steam Locomotive Society (SLSLS) Signal Box door!

### Running problems?

Well, she now runs well after attention to the return crank fixings, springing, brake hangers (first they rub the wheels, then they hit the rods!), the reverser, vacuum ejector, drawgear, etc, etc. Some trouble was also experienced with the crossheads picking up on the side of the slidebar due to too neat a fit.

### Boiler, second thoughts?

There is no doubt that the steel boiler was cheaper than a copper equivalent and although it takes a relatively long time to raise steam initially, once hot, it is a delight. However, the backhead inspection plugs are impossible to get at, being buried under a backhead cover sheet. Also the clocks and water gauges are mounted after the cover sheet was installed, which means that it will be necessary to undergo major dismantling for the two-yearly boiler inspection, whereas a copper boiler would be no difficulty in this regard.

Perhaps Briggs type boilers are not really suitable for the smaller gauge prototypical main line type models, as I can't see how the problem could have been easily avoidable.

### It's busier after completion!

There is no doubt that the four weeks following the steam test were probably the most hectic in all the 10 years of construction, fixing teething troubles and completing the unfinished bits.

Big engines definitely leave big leftovers. So, for a change, I'll use the leftovers to make some simple 0 gauge engines for the boys. Nothing like a change in scale!

### Confessions of a two year old

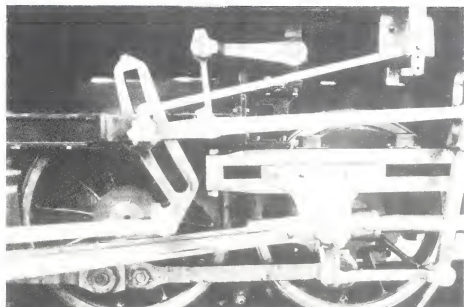
It was amazing how fast two years then passed. My V class was up for its two yearly boiler inspection (Briggs steel boiler) and as this in itself was a major dismantling task I decided to correct some other items at the same time. Readers might be interested in the work undertaken.

### Inspection preparations

I needed to make the engine easier to prepare for boiler inspections. At the same time I

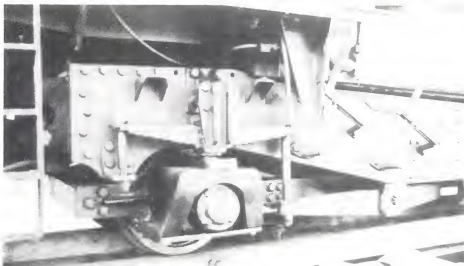


Acting Driver Andrew Allison has just got the signal and is cracking the throttle on to lift away a short freight on the outer main.



*A closeup of the heavy duty crosshead and valve gear.*

Photo: Neil Graham



*Closeup view of the trailing truck.*

Photo: Neil Graham

wanted extra insulation to prevent the paint burning off the firebox side lagging. The turret took steam from the end of the boiler and this suffered badly from water being picked up as it surged backwards and forwards in the boiler. The effect of this was that, unless the water level was well down, operation of the injectors, whistle and brake ejector were variable (to say the least) while running.

### The problems

The wheels were cast iron and the leading flanges had worn down from  $\frac{5}{32}$ " to  $\frac{3}{32}$ " thick. Maybe the iron was soft as one of the tender wheels had worn  $\frac{1}{16}$ " smaller in diameter than it was made. I also had continual trouble with one water gauge glass breaking (until I got sick of it and plugged it up). This was traced to a misalignment of the fittings.

I was also unhappy with the lateral play in the drivers axleboxes (the result of a mistaken belief that it was needed to go round the sharp curves normally found on a 5" gauge railway) as this caused the brake rigging to hit the coupling rods or rub on the wheel faces (depending on the displacement). I also suspected it was the source of some banging and clanging.

I subsequently discovered that the engine steam brake rigging had seized at one joint making proper operation awkward.

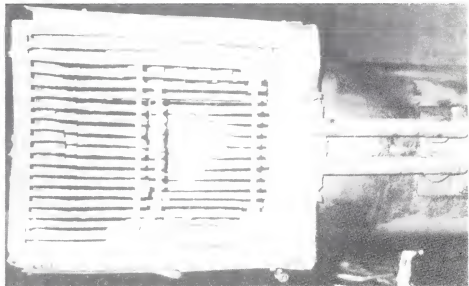
Initial steam raising from cold was very slow, and when we finally had some steam the blower was ineffectual at low pressure. There was also the odd disconcerting tendency to gulp water down the main steam pipe and flash steam it in the superheaters, making the engine want to "get up and go", usually when I wanted to stop!

The boiler inspection proved an ideal time to correct these defects. Off came the boiler and before the hydrostatic test was made some internal modifications were made.

### Boiler fix-its

A  $\frac{3}{16}$ " copper pipe was run from the dome to the turret fitting. This needed some wangling to put into place, and a re-arrangement of the turret connections. A water/steam separator was installed inside the dome. This consisted of two circular discs of copper. Each disc had sufficient holes to give at least the same cross-sectional area of the main steam pipe. The two discs were silver soldered  $\frac{1}{8}$ " apart and with holes offset to give the steam a tortuous path.

The main steam pipe and turret pipe poked up through holes in the separator, the turret pipe being nutted to prevent it dropping down into the boiler. After inspection and hydrostatic testing, thermal insulation was installed inside the firebox. A layer was glued to the dry sides behind the water wall and to the dry back. Because of the water walls, the sides can't be disturbed, but I fitted a steel lining sheet to the back to protect the insulation. The combustion chamber dry curved bottom surface was coated with a thick layer of refractory cement. This seems to work okay and to date has not cracked or dislodged in service. Thermal blanket was also used on the outside of the dry firebox walls and the rear plate. A spacer which retains the lagging at the bottom of the dry firebox side was a major source of heat transfer. This was retained, but was



*A look into the firebox after the boiler was lifted from the engine in preparation for its boiler inspection. Note the large hole in the firegrate.*

drilled along its length with air holes to reduce the mass of conductive material and improve air cooling between the firebox and lagging. Any trapped air here, as it is heated, would make its way up and out the safety valve holes, ( sounds good in theory ).

The blower pipe, which runs under the lagging, was relaid with 3/16" thin wall copper pipe (replacing the original 1/8" pipe) to improve blower performance. This was done before the lagging was reapplied, after cleaning back and repainting.

The home made vacuum ejector with its associated pipework (which resembled the pipework on the prototype) was scrapped and replaced with a commercial vacuum ejector.

## Running gear fix-its

Work was simultaneously going on on the chassis. Each wheel set was checked for lateral play so that thrust spacers could be manufactured. Steel tyres, provided by a fellow club member some years ago, were finished up to size before the wheel sets were turned. During this process I had one wheel slip on the axle ( originally shrink fitted, no keys). Thankfully, the correct position was previously marked by a small chisel mark across the end of the axle and wheel and it was easily repositioned and then pinned. The tyres were shrunk on (0.006" interference for the 65# diameter skeleton ) before profiling to SLSLS

wheel standards. The intermediate and driving wheels were given thin flanges.

The axlebox spacers were secured to the outside of the hornways. All measurable lateral movement was removed from the first three axles, but the trailing driver retains about 12 thou. Care was taken to ensure that the boxes can still lift and rock over track imperfections. Coupling and connecting rods also had attention to remove excessive lateral clearance.

The chassis was reassembled. Before mating with the boiler, the blast pipe was reduced in height and a joint provided at the base of the smokebox. The removed portion was added to the blast pipe. This allows removal of the blast pipe and unobstructed access to the smoke box tube plate inspection plug. Simultaneously with this work, the four blower jets were opened out from No.60 to No.55 drill size.

The operating shafts for the ashpan doors were coupled using collars and grub screws. These slipped in use and the grub screws removed, fitting drilled through, and a roll pin fitted. This now gives a firm positive action.

The boiler was dropped back onto the chassis. The pipes in the smokebox were sealed with Dow Corning's silicon Roof and Gutter Sealer (a tip from another club member) and this is very simple and effective compared with past methods.

Reassembly took a week of evenings culminating in a steam up at home on a Sunday afternoon.

This proved okay (the paint on the firebox lagging stayed green!) and so the

following day the engine was cleaned down and given a sprucing up coat of paint on the smokebox and running boards, and other areas touched up as necessary before returning to service.

## Subsequent in service performance

In service, all the changes have proved their worth. The engine sits steadily on the track, and it still goes round the curves! I can now blow the whistle whenever I want and get a good note, and I can run with the injector on with confidence. As an extra bonus, the cooler cab has improved the operation of the tapered steam cock, used for the drain valves, and the engine steam brake valve, both of which used to seize with the heat. The steel tyres have lifted the appearance of the loco also.

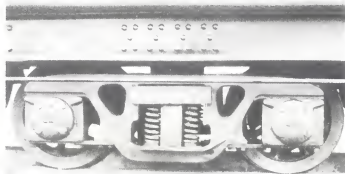
The project took three months of spare time, including some late nights, but it was worth it.



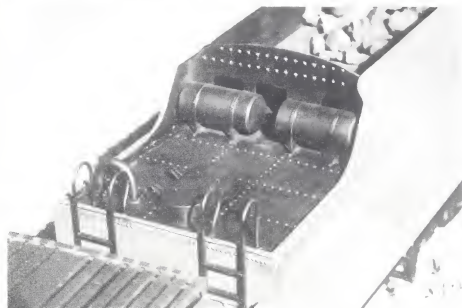
## WAGR V class 2-8-2

### Specifications

Gauge	5"
Scale	1 1/2":1ft (1/8 full size)
Cylinders	2 1/4" x 3 1/4" bore and stroke
Piston Valve Dia.	1 1/16" with Cliplock type rings
Valve travel	13/16"
Valve Diameter	63/64"
Boiler Feed	2 x Injectors 1 x 25oz/minute 1 x 60oz/minute 2 x Single acting feed pumps 9/16" bore x 7/8" stroke
Boiler pressure	100 psi
Boiler type	Steel Briggs with comb.chamber
Boiler capacity	20 litres
Boiler diameter	8"
Boiler length	37 1/2"
Tubes	19 x 5/8" x 21 5/8" long
Flues	4 x 1 1/8" OD 21 5/8" long
Waterwalls headers	3/4" dia.
Verticals	5 each side x 1 1/2" dia.
Superheaters	8 spearhead elements 3/8" dia.
Regulator type	1/2" Teflon Ball Valve
Brakes	Steam on engine Vacuum on tender Handbrake on tender
Safety Valves	3 x 3/16" bore pop safety valves.
Weight	238kg (513lbs)
Overall length	8'7" over couplings
Width	13 1/2"
Height	19 1/4"
Tender Capacity	50 litres



Left shows a closeup of the tender bogies.



Looking down onto the tender deck. Note the unusual practice of having two rear ladders



*The afternoon sun glistens off the flanks of an immaculate V.1213. The big Mikado has not long been returned to service after years of meticulous restoration by a team of volunteers led by Ian Willis at his Rivervale works.*

They quickly built up a reputation for free steaming and reliability. Not long after 1201 entered service it was used to conduct several load trials and tests. On one occasion it made a test run between Brunswick

Junction and East Perth with a train of total weight 1250 tons! Subsequent to these tests, new load tables were for the V class which had higher allowable loads than the older S class.

Their reliability was maintained for all of their life. It is a testament to this that very few modifications were issued or carried out to them.

### Modifications

The sandboxes on all engines were enlarged early in their life. The capacity was increased from 5 to 10.5 cubic feet.

As there was a tendency for the flanges on the wheels on the leading truck and leading coupled wheels to wear fairly quickly, modifications were made to allow the exchange of the trailing and leading coupled wheels. In an effort to improve cylinder lubrication, two of the locomotives had their displacement lubricators replaced with Nathan mechanical type. However, this was done late in the life (1968) of the Vs and as the end of steam traction was in sight, no further locomotives had mechanical lubricators fitted

## WAGR V class 2-8-2 Locomotives

Compiled by Neil Graham and Barry Glover

*Photos by Graeme Stancliffe excepted where noted*

The V-class were the last steam locomotives introduced on the WAGR. Twenty four in number, they were imported from Robert Stephenson and Hawthorn Ltd of the UK and entered service in 1955-56. It is curious to note that the contract for the supply went to Beyer-Peacock, however, they were unable to fulfil the order so they in turn sub-contracted the order to RS & H Ltd.

### A modern locomotive

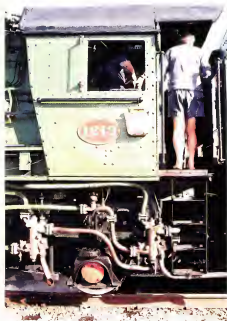
Modern they were (with the exception of the plate frames), with a big fat boiler that

would have looked at home on any modern US or South African motive power.

Some of the features included a large wide firebox boiler fitted with Nicholson thermic syphons, moderately high boiler pressure, a large combustion chamber, power reverser, modern Walschaerts valve gear with its long expansion link, Master Mechanics front end and roller bearings fitted on all axles and the return crank. The intermediate coupled wheels had thin flanges, in deference to the tight curvature of the WAGR tracks.

### In service

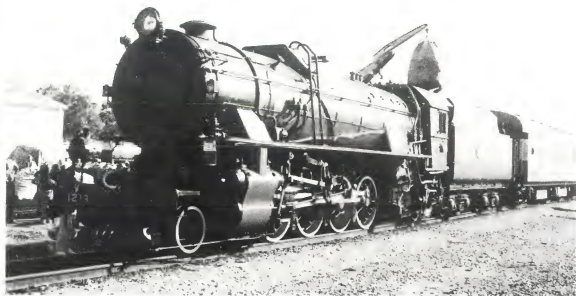
They were intended mainly to haul coal from the Collie coalfields and this they did. However, they quickly wandered as their use was extended to general freight on the Eastern and Great Southern mainlines.



*A look onto the crowded footplate of V.1213. Note that both feedwater injectors are on the one side of the locomotive.*



*The sun has well and truly set as V.1213 sits at Perth terminal station at the end of a successful trip to Collie and return*



After a hard run from Perth, V.1213, still connected to its carriages takes on coal at Benger

### Retiring from WAGR service

Most of the engines remained in service for 15 years. In fact the V class saw out the steam era in Western Australia with the first being withdrawn when they were working their original intended area out of Collie depot when ousted by the dreaded diesels. The last was retired in December 1991. V.1220 did continue working enthusiast specials until mid 1972 before retiring to the ARHS Museum at Bassendean.

### Preserved units

As well as V.1220 at the Museum, 1215 is at Collie Roundhouse and 1213 ended up at the Hotham Valley Railway for a while (more on this later). 1209 went to the Bellarine Peninsular Railway at Queenscliff in Victoria.

In mid 1980s the Hotham Valley Railway needed to raise funds and to achieve this they

sold V.1213 to Ian Willis. Ian moved it from Forrestfield to his engineering shops at Riverdale by truck and it was placed on its own special length of track for the forthcoming work to be done. A complete restoration to full running order was undertaken by Ian Willis and his able band of volunteers.

### Trials

In May 1992, restoration work was completed and the locomotive was moved back to Forrestfield for re-commissioning and trials.

Late May saw its first big run — a revenue freight to Northam and return. The 780 ton load and heavy grades were taken in the locomotive's stride and on return the only evidence of the days hard work was some blistered paint on the smokebox.

The locomotive performed admirably and no problems of any significance were encountered

### Hauling passengers

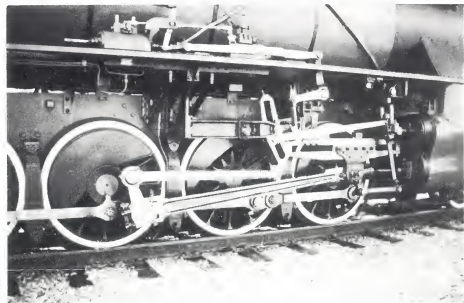
V.1213 had its first fan trip on Sunday 7 June 1992. With an eight car set (ex South African Railways) now owned by the Hotham Valley Railway, the big Mikado blasted out of Perth railway station some twenty minutes late for a first class run to Collie and an on time arrival. This included a coal and water stops at Pinjarra and a water stop and crew change at Benger! The excellent performance of the locomotive was exemplified by the ear splitting grin all over Ian Willis's face.

The trip home to Perth was tabled to be 25 minutes quicker than the down run. An on time departure saw a very brisk run home with V.1213 seeming to run faster as it got darker. Arrival Perth saw 30 minutes shaved of the timetable. The up run was thus 55 minutes quicker than the run to Collie. The end of this most successful day saw Ian Willis and his assistants walking ten feet tall.

V.1213 is still owned and kept in top working order by Ian Willis and has been based at Pemberton for some time now. It makes the occasional foray north to Perth to work fantrips according to demand but it mainly stamps out of its home base these days.

### References:

*Locomotives of Australia* - Leon Oberger, Reed Books 1875  
*A History of WAGR Steam Locomotives* - Adrian Gunzburg, ARHS (WA Div.) 1984



A look at the business end of the engine, detailing the motion and the power reverse. The superb presentation of the locomotive following its restoration is readily apparent in this view.

### V class 2-8-2

L.O.A.	69"8"
Height	12"8"
Width	9'6"
Driving Wheels Diameter	4'3"
Trucks & Bogie Wheels	2'7"
Cylinders	19x26
Weight in Working Order	135 tons
Drivers' Axle Load	14.5 tons
Tractive effort	33,630 lbs
Factor of adhesion	3.8
Boiler between tubeplates	14'0"
Boiler diameter	6'0"
Grate Area	40sq. ft
Boiler pressure	215 psi
Tender water capacity	5390 gals
Coal Capacity	7 tons

# Furnaces — Coke, Wood or Gas Fired?

By Allan Wright

My first furnace, fired by coke, was very successful. It would handle up to 15lb crucibles and took about 45 minutes between pours. Following a move from Sydney to the north coast, with no coke available, I tried firing it on wood.

## Wood firing

Mainly old building materials complete with nails. I had to dock the lot into four inch lengths to fit the furnace, two days sawing for one day of burning.

From lighting to pouring took about 2½ hours. The wood was packed over the crucible as high as possible and I hardly stopped shovelling more on. My wife Vera worked almost non-stop keeping two wheelbarrows filled with wood.

The heat from the four-foot flames was unbearable. A flap on the air intake was opened to give a curtain of air, dropping the intensity of the fire a lot. However overalls, gloves and a welding helmet plus two 18 inch fans, to blow some of the heat away, were necessary to approach the furnace.

This type of furnace cannot get rid of its ash and clinker. The fire becoming shallower with use. The fire was worked for about five hours or so until it became too shallow and inefficient. Next day it was necessary to stand on top with a crow bar to break up the clinker, burnt nails and all. A lot of bronze was reclaimed for bearings though it's best use was for aluminium. A water cooled ladle handle proved most comfortable to work with.



The gas fired version of the furnace.

## Gas firing

The furnace is now fuelled by LP gas, following a design published in *Live Steam* magazine several years ago.

Be careful — gas is not to be treated lightly! Anybody wishing to build this sort of set-up should be very thorough with both construction methods and use.

The photo shows the general layout of the furnace with the swing lid and its 2½" chimney hole. The lid was first lined with clay which proved troublesome with pieces falling into the crucible and fire. This was overcome by putting a flange on the bottom of the chim-

ney in the lid and welding ¼" stainless steel petals from the centre flange to the outside diameter.

In operation the main problem was getting sufficient air in relation to gas for maximum heat. Compared to the old set up this furnace requires a much stronger blower. The original plans stated a vacuum cleaner would do the job. This I doubted as ¾" was the size given for the primary air hole for the gas air mixture. I modified the nozzle with a ring of ¼" holes around the outside which gave as much air again.

I fitted two drive belts to the blower to guard against belt slippage. A sliding sleeve on the 2" air feed pipe, covering a line of holes gave all the control needed in regulating the gas to air ratio. There are two burners fitted tangentially which gives quite a swirl and more even heat distribution.

A 100lb gas cylinder is used with a regulator and pressure gauge. Most importantly a flash back arrestor CIG PN 308734 (12)

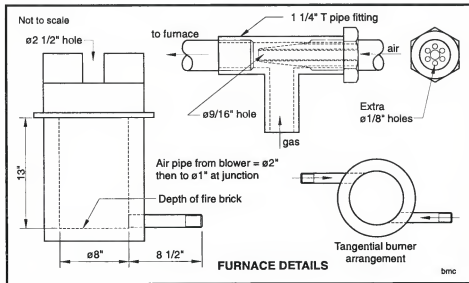
is also used.

When working, the gauge is reading 60lbs. This decreases as the gas enters the ½" feed pipe and then finally into the 1¼" pipe and tee fitting which forms the mixing chamber. I should mention that while my furnace is made entirely of stainless steel, it is most important that the burners be of stainless steel.

In operation I use two crucibles, the bottom one packed with the best solid scrap and the top one with shavings, copper wire etc. The top one has a ¾" hole in the bottom so most of the dross remains there. This is lifted out and scraped clean and the bottom crucible lifted out which then mostly contains enough metal for pouring.

When lighting up I burn an old rag soaked in kero and sump oil in the bottom to dry out the dampness of the crucible. A gentle air pressure is supplied, then the gas turned on. The fire now burns with excess gas and little heat. By slowly covering the holes in the control sleeve the fire heats up thus bringing the furnace up to maximum heat slowly. The lid is then closed and it usually takes around 30 minutes to melt bronze. Pouring basins etc can be heated up on top before use.

I hope this has been of interest. After working with coke, wood and gas furnaces I feel that the coke fired version was the better furnace by far.



# Sand Cast Metal Founding for the Model Engineer

A practical series by Bob White

## Part 4 — Hands-on Patternmaking

*Photos by Bob White and Drawings for publication by Rod Heslehurst.*

**M**y first project for the hands on part of this series is the base for a railway throw over point lever stand. Now you may not have any need what so ever for a throw over point lever stand for your triple expansion marine engine or Foden steam truck however, those of you who do want to learn how to make your own patterns will glean some knowledge from the article that you can then apply to your own field of endeavour.

My requirement was to make a point throw over lever that could be operated by the driver

from the loco when facing the point yet to still allow the point to be trailed through when travelling from the opposite direction. This is a common enough problem which has many solutions but so often they are very unprototypical. My penchant is for realism but I soon realised that if the lever stand assembly were true to scale it would only measure 2½ inches high. This would be rather difficult for the driver to reach and may be so delicate that he could bend it. Also, it would almost become

an unseen hazard to stand on or trip over on my 5" gauge ground level railway.

### The point lever

The subsequent General Arrangement drawing in Figure 1 shows a design which is overscale enough to see and operate, yet not so much as to become grotesque. It still retains the characteristic features of the prototype, so essential in the creation of a good model yet is light enough in construction to allow a four wheel wagon to push the point blade over when trailing.

### Initial pattern design

The first step in producing our pattern is to select the joint or parting line for the two halves of the mould. This item is similar to many other simple shapes in that it could be jointed either horizontally or vertically through the job with pro's and con's for either way. I have selected a horizontal joint, positioned on the base line of the casting, as the best "finished casting" choice. This makes for a one piece pattern and a two part core box. Figures 2 and 3 illustrate the two joint line alternatives and the for and against points for each are as follows:

#### Vertically parted (Figure 2)

The core box is simple to make for the base surfaces are parallel. It will be in two parts, parted vertically and can be open top and bottom.

The pattern has to be in two parts and although the upstand portion of the frame and the core prints will all be parallel to the joint, the base has to be tapered. The hold down bolt bosses will have to be "D" bosses and we can incorporate pivot pin bosses.

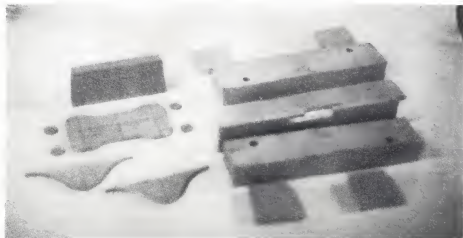
#### Base line parted (Figure 3)

The main feature is that the base will be flat as cast. The pattern is in one piece and the raised boss detail for the hold down bolts will be prototypical. The core box will still be in two parts. However, the main structural surfaces will have to be bevelled, rather than parallel, to mate with the moulding taper now necessary on the pattern core print. This raises the degree of difficulty for the casual patternmaker.

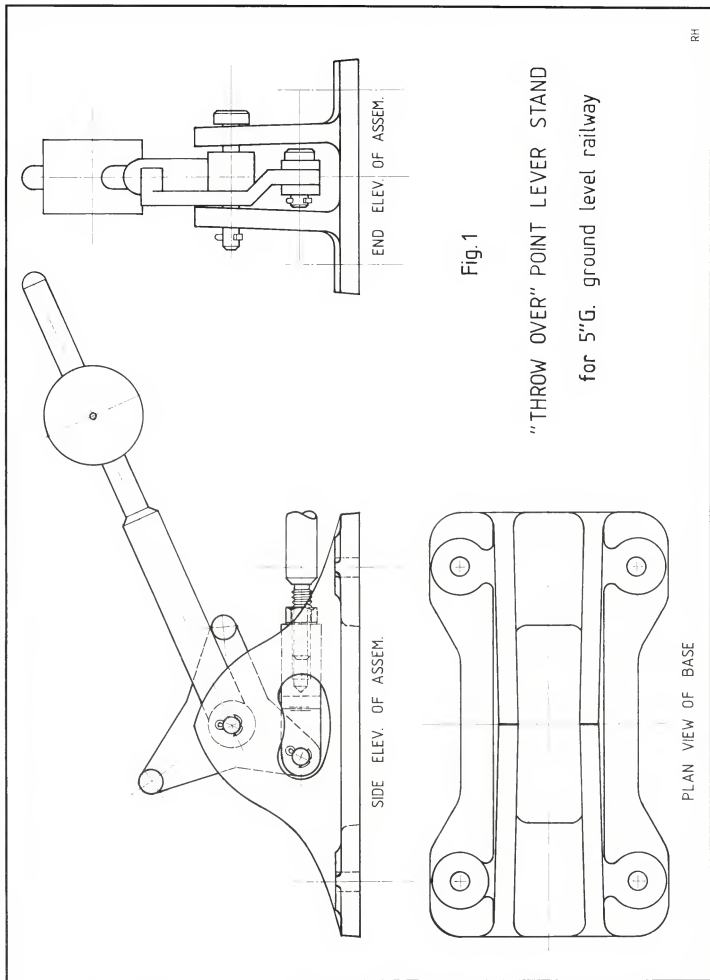
In summary, it's six-of-one-and-half-a-dozen-of-the-other but my whole point is to show the variables to be considered when appraising a job before selecting the joint line.

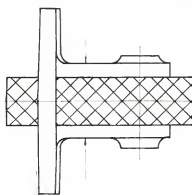
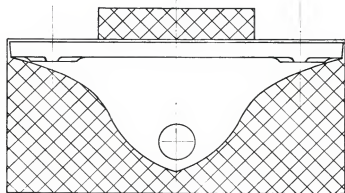
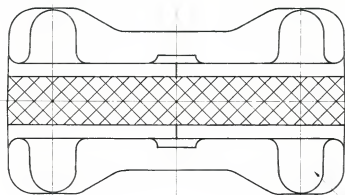


*The above photo shows routing out the slot in the core box member under the drill press.*



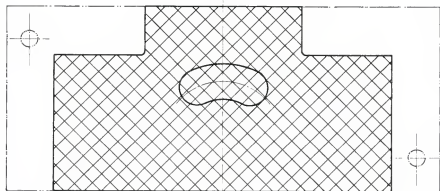
*Above shows all the parts made up and ready for assembly. The patterns are on the left and the core boxes are on the right.*





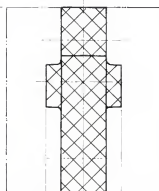
- cored slots will "kiss touch"
- 1 deg. min. moulding taper on base surface
- pattern / mould joint line
- "D" bosses

## PATTERN



## CORE / C' BOX

c'box o'line



parallel construction

c'box faces open each end & parallel

RH

Fig. 2 "Vertically Parted"

## Pattern construction

One generally makes the pattern first, for all work, with core box print sizes then being taken from the pattern and a little assembly clearance being allowed for in the transfer. A quarter to half a millimetre on overall dimensions will do for our size of work.

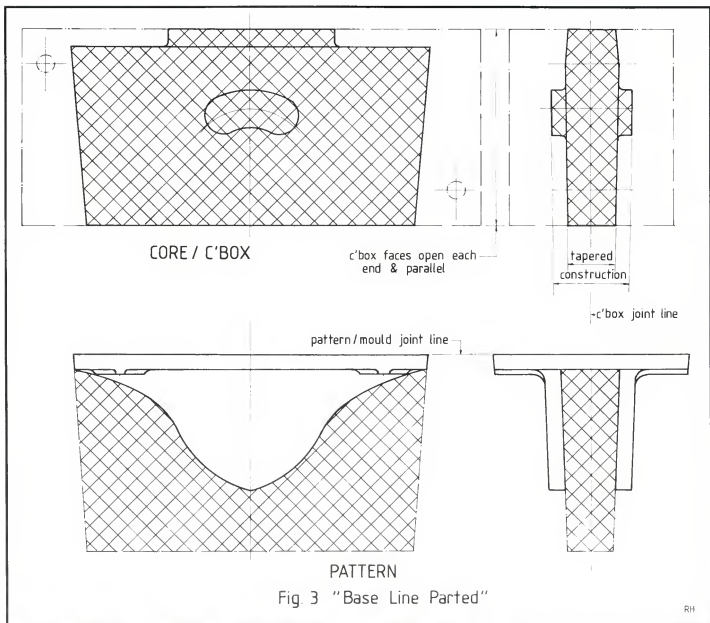
The base is made first from a piece of timber dressed to the correct thickness. Centre lines are carefully laid out, the outline drawn

and then the piece can be sawn and sanded to size.

The core print is next and starts as a strip of timber with parallel dressed edges to the depth dimension and one dressed face square to these parallel surfaces. The centre line is then run across each of the parallel surfaces with a scribing block. The taper surface dimensions can be set out off this with a fine pencil and then run with the scribing block.

The piece is then planed back to size. The cross centre line can now be scribed all round the work. The ends are now marked out from this, waste sawn off and the piece sanded to size on the disc. Finally, mark the longitudinal centre lines across the ends.

Check Plates are made next. These are from one piece of timber dressed to thickness and with the base level planed along one edge.



Above photo illustrates applying the bog fillets to the pattern.

Mark out the centre line for each plate and then lay out each outline from this. Saw and sand to shape. This only leaves the four tiny bosses to go. These are marked out (centre lines first *always* and then the circles) on a small sliver of timber of correct thickness. They are then carefully sawn and pared to size with a dead sharp chisel. Finally glue all the parts together, taking care to line up all centre lines! When the glue is dry, add the bog fillets and then place aside ready to paint with the core box.

#### The core box

The main body sections are made first both from the one length of timber. This is dressed on one face and two parallel edges. The bevel face is then marked out and dressed. The two core box sections are now marked out on this bevel face including the curved slots and finally sawn apart. A bevelled packing piece is then planed up and tacked to the back of each of these in turn to bring the bevelled face back to parallel for routing out the slot under the drill press. This is done freehand with a small

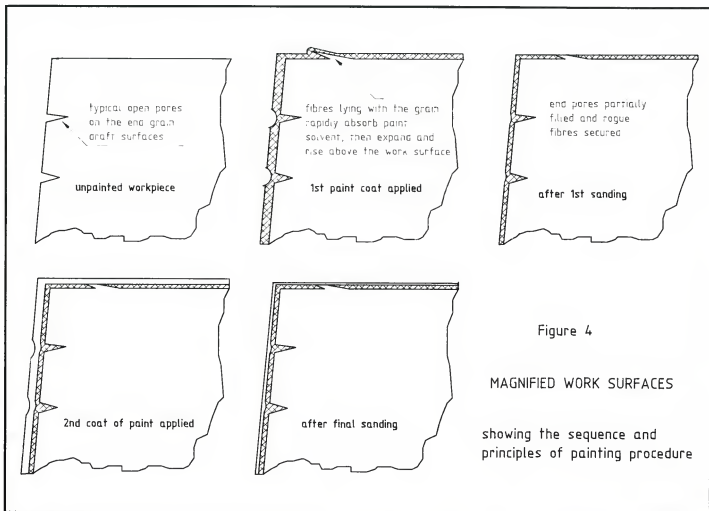


Figure 4

#### MAGNIFIED WORK SURFACES

showing the sequence and principles of painting procedure

flat bottomed drill or end mill in small depths of cut until final depth is reached against the present depth stop. The sides are then carefully given a liberal taper with a small gouge.

One piece of timber is now dressed up for the ends and indeed, with a bit of forethought these could be made from the packing piece used for the routing. The ends are cut to length and disc sanded on the working face. Finally the top plates are dressed to size, core portions marked out, cut out and sanded.

#### Assembly

The various pieces are now ready for assembly with the aid of the glue tube and a few panel pins taking great care to align centre lines and relevant edge lines.

The two halves are carefully lined up on centre lines and reference surfaces and clamped together for drilling the dowel holes. Just a note about dowels at this point. They should always be arranged so that the two halves of either a core box or pattern cannot be assembled back to front. If this cannot be achieved by offsetting, the dowels can be made different diameters. Various diameter wooden dowels can be readily purchased in 2 metre lengths from good hardware shops.

Finally, the varying overall lengths are all trimmed off and the corners of the assembled box given a quick chamfer on the sanding disc to make it easier on the hands when in use.

#### Painting

We do not paint wooden pattern tooling to make it a nice colour like we do the front fence. We paint it firstly to fill the wood grain pores and to secure the projecting loose timber fibres and secondly to prevent the timber from absorbing moisture from the air, during storage and the sand during moulding.

Finally, we may also like to paint the pattern core prints a different colour to indicate that this area is indeed for registration of a core print and is not just part of the casting.

I have on occasions seen batches of castings that had to be melted down again for they had lovely cast core prints instead of cored cavities. It can easily happen off metal or plastic tooling when the prints are not a very evident part of the pattern and when production control procedures are lax. Murphy's Law, I think it's called.

So, it's on to painting our job and you would do well to refer back to the couple of paragraphs I wrote as an overview of the subject on page 41 of the November-December 1995 issue.

Reference to Figure 4 will explain the simple principles involved and the steps to take.

Finally, take care with the sanding back so as not to round off the print corners or to undercut the joint face.

*To be continued ...*



#### Workshop Hints

##### Soldering small tubes

When soldering a small copper steam pipe into a fitting, the tube may become blocked with solder. This problem may be prevented by blocking the end of the tube with a piece of soap. After soldering, the plug may be softened by immersing the tube in hot water, then blowing through it from the other end.

##### Keep your temper

In order to save a few minutes and preserve your temper, it is a good plan, after a drilling job has been completed, to touch up the cutting edge of the drill. Draw the drill through an oily rag prior to putting it away. This saves the temper when in a hurry the next time the drill is required.

##### Preventing rust

If you have some polished steel tools and you want to preserve their lustre. Try this old-time hint. Keep the tools in a box in which is a piece of ordinary camphor.



# Railex '96

by Julian Ridgers

Photos by Greg Waddie

Even in our wildest dreams, the Evandale Light Railway and Steam Society couldn't have imagined the success we had with Railex '96, our annual steam and hobby exhibition.

## Blowing the trumpet

For nearly a year, the Jeremiahs and Jonahs had told us to be cautious, to keep it small, to hold the show perhaps every second year, and so on. In the end, brilliant television advertising coupled with the best Spring weather imaginable had patrons literally beating at our gates to get in right from the start, and well before opening time at that. As well, the whole of Northern Tasmania had been liberally sprinkled with roadside signs, a railway signal actually, telling the public about Railex. It certainly pays to blow your own trumpet occasionally!

## The expanded exhibition

Railex '96 broke from its young tradition, and expanded to become not only a railway exhibition, but one featuring other forms of transport as well, not just models, but vintage cars and motorcycles. There was music from a jazz band, and traditional railway music (is there such a thing?) from the Launceston City Band, celebrating their 120th anniversary.

Digressing momentarily from all things rail, one of the biggest beneficiaries of Railex is the village of Evandale, home town to Railex, only 20 kilometres South of Launceston near Launceston airport, but in reality, a whole world away from the rush and bustle of modern society: in fact the ideal setting for a model railway, in a location where



A busy time at the station as Greame Reardon glides past with a full load hauled by his TGR Yclass loco. Jock McLachlan pauses at the station with his Umu Bay Railway Hydraulic loco. Jim Gray on crowd control duty at the gate.

the biggest annual events are Railex and the National Penny Farthing cycling championships.

## The exhibitors

So now, for a description of Railex, over to inside exhibits co-ordinator, Steve Oppermann. Immediately inside the doors, an exhibit from the *Tasmanian Railway Hobbyist*, featuring items from the magazine, including construction projects during the previous year. Iron Horse Hobbies, from New South Wales,

had many pre-loved model railway items for sale, a first for Railex, and well-received. Opposite, the star of the show, Steve says, an absolutely perfectly detailed Z gauge layout, by Thomas Marchel, of Launceston.

"Considering the smallness of the scale, an absolute wealth of detail had been incorporated," Steve says, "and the layout certainly attracted a continuous stream of spectators pushing in to get a better look."

Launceston Model Railway Club had an N gauge layout coupled with a display of modelling techniques, followed by George Town Model Railroad and Engineers club with an N gauge modular layout with an American flavour. Dr David Cooke, the initiator of Railex, took time out to organise New South Wales Illawarra region in HO gauge. Tiger Models again had a sales stand, with a selection of new model railway equipment in a variety of gauges.

Peter Lambert, from Hobart, fascinated the crowd with RTP (round the pole) model planes, suitable for indoor flying. Launceston Model Aero Club mounted an impressive display, with a hands-on Ray Brown flight simulator program, performing all the functions of a flying model, but in complete safety (for the model). Some of the visitors surprised the club at how quickly they mastered a difficult task.

Tasmania's historical preservation movement was represented by the Abt Railway society and the Launceston Tramway Museum Society, who both had extensive photographic



Commonwealth Railways diesel loco built by Max Hays — a regular attendee at Railex.



John Adams' Pirate ship — a star of the show!



Chas Goodwin and his top performing Dundas.

displays. Tas'N'Track's N scale modular layout from Hobart drew admiring crowds. A newcomer to the show, Carey Hire, created interest with many lathes, drill presses and other desirable machinery.

New this year, die-cast model cars and bikes, farm machinery and tractors, and some lovely period-piece tinplate models. The Hornby Association of Australia also had a choice display.

The Evandale Light Railway and Steam Society mounted a stand, both with complete models, and with many part-completed projects. A novelty for Raillex, a pedal-powered aeroplane for youngsters, and many tickets sold in a raffle for it.

Eight year old Byron Simm, from Perth, Northern Tasmania, fascinated both youngsters and oldies with his layout: he let everyone play with his trains, and it was much appreciated. Amazingly, Byron asked to be included in the exhibition, and asked to be allowed to let everyone handle his exhibit... a true public minded kid.

Still on a lighter note, our landowner, Greg Waddle, had a few heart-stopping moments, when many willing hands from the Deaf Society tried to park a trailered Harley Davidson motorcycle (to be raffled) in Greg's garage, a repository of vintage cars and train layouts. Greg's looks of horror, shouts and frantic hand signals not to hit his valuables went un-

heeded. Greg's now learning sign language, we hear.

### Organisation of Raillex

How did Raillex all come together? Co-ordinator Greg Waddle says there was an enormous amount of work behind the scenes, particularly by secretary Di Lawson, and the committee to cover subjects as diverse as advertising, food, a kite display, safety, inspection of steam certificates, insurance, brochures, crowd control — in short, nights and nights of painstaking organisation. Safety was monitored through the good offices of St Johns Ambulance. ELRSS members' families kept everything going, with a generous amount of time devoted to keeping the kettle boiling and the food arriving at regular intervals.

Outside, the activities focused on operation of the ELRSS miniature trains, with four thousand passengers carried, each for two laps of the track. A feature, a visit by a group from an old people's home, who had to be helped bodily on to the trains, but who told organisers later their little trip was one of the highlights of their lives. Many personally thanked the driver and guard, and the station staff.

On the train front, Max Hays, from Devonport, set the tone for the gathering by double heading his massive Commonwealth Railways petrol electric locos, which just loafed around the steep track with a very considerable load.

Jock McLachlan, from Rosebery, on the West Coast, used his petrol-hydraulic loco to good effect, and Graeme Reardon, from Launceston, got more and more game with passenger numbers, almost certainly hauling the biggest trains. Chas Goodwin, from Ulverstone, was there again with *Dundas*, and Chas ended the day wearing his

trademark black face, the result of liberal oiling and keeping a close eye on the fire. Peter Crowder pulled huge loads of school kids on the Friday, as did ELRSS president Peter Lawson, with his newly commissioned steamer, and Ray Peck, taking a break from driving steam traction engines to run his new loco.

On the elevated track, the local contingent was joined by visitor Keith Hartley, from Melbourne, who steamed steadily for hours on end — a model of consistency — while long-time member of the Hobart Miniature Steam Society, Ian Simpson, recovering from heart bypass surgery, enthusiastically put the event on video and film. Another visitor from the South, Geoff Stevens, who spent a considerable time driving ELRSS secretary Julian Ridgers' *Sweet Pea*.

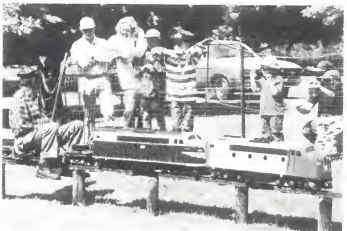
Even though it was primarily a train exhibition, a group of enthusiasts from Hobart, led by John Adams, just about stole the show with their model boats! Everything from a steam-powered picket boat steered by cartoon character Garfield, down to a pirate's ship, with a cunningly disguised water cannon in the bowsprit. The ponds were lined by big and little kids who just couldn't get enough!

Even the Tasmanian Government got in on the act, Speaker of the House of Assembly Frank Madill M.H.A. officially opening the show, and Celebrate Tasmania, an offshoot of Tourism Tasmania, publicising Raillex in its calendar of events, and providing support promotional material.

### Success and more track

As we said at the outset, Raillex '96 was a great financial success, and already track extensions are planned: 350 metres of 5" gauge and 275 metres of 7 1/4" gauge. The 5" gauge track will be independent from the main ground level track. We've also completed a new storage shed, nicely complementing the major locomotive and rolling stock shed erected earlier in the year, along with a kiosk.

There may never be another year as good as 1996, that's the nature of things, but already the ELRSS has committed to running another Raillex in November 1997!



Geoff Baumgartner and his two Vic Rail S class running multiple unit.

# A Design for an Ocean Going Tug

by Nautilus

*This article is reproduced with permission from articles that appeared in the Model Engineer in Australia and New Zealand, July, August 1937 and June, July 1938 ... ed*

The proposed model is 4'5" long from the aft side of the stern post to the fore side of the stem. The breadth of the vessel is to be 1 1/8" at the widest part, and the depth 7 1/4" from the top of the keel amidships to the top of the deck at the side. The thickness of the deck is 1/4" and it projects from side of model 3/16" to form a rubbing strip or belting. The stern overhangs for a distance of 2 1/8", which, together with the width of the belting, gives an overall length of 4'8 1/8".

## Material choice

The hull may be made of tinplate in narrow strips soldered at the edges; but it is rather difficult to make a neat job, and requires some skill in the tinsmith's art. A block model of wood, either in one piece or two pieces joined at the middle line, makes a good job; but the work of digging out is very tiresome, and there is a danger of going through and thus spoiling the model, also the wood will be rather difficult to obtain of suitable size and quality. It is, therefore, proposed to build the model in layers, which, to my mind, is the simplest method. The following are needed to start:-

- One piece 4'9" long by 12" wide, and 2 3/4" thick, for the top or sheer piece;
- Four pieces, 4'7" long by 12" wide, and exactly 1/4" thick;
- One piece, 4'6" long by 12" wide and 1 7/8" thick for the bottom pieces.

These must be the very best selected Huon pine or cedar, free from knots, sap and other defects, thoroughly seasoned, and cut full to the sizes given. You will also require a piece of sycamore (4'9" long by 12 1/2" wide and 1/4" thick), for the deck, and a piece of thin wood as used for the backs of picture frames, for making templates for the various sections.

## The hull

The 1 1/4" pieces are to be planed dead true on each surface, and to exactly 1 3/16" thick; and the upper and lower sides of the bottom and top piece truly planed; then the whole of the pieces may be fastened temporarily together with a screw at each corner. Now plane the resulting block up to exactly 12" wide, the sides being square with the surface of the pieces. Mark off the profile of the ship on both sides of the piece, with the exception of the stern post, keel, and all above the underside of the deck which are attachments, and are not a part of the block model; also the positions of the sections. Now plane the bottom of the block down to line, top of keel, and

set off the rise of floor — which is 1 7/8" — on each side; set off the centre line and mark same permanently by means of a headless pin, far enough from each end to come clear of the round up of forefoot, etc., say, at about Nos. 1 and 8 sections; then the half thickness of keel, which is 3/8", must be set off on each side of centre line and the block planed up to the bevel given by the rise of floor, as shown in Figure 4. Cut out the remainder of profile, and take model pieces apart.

The water planes and deck line must now be marked on, and it will be necessary for this purpose to procure a thin batten of pine about 1/4" square at one end, tapered to 1/8" by 1/16" thick at the other. This batten may be about 5 feet long, and is to be held in place by means of ordinary pins stuck into the model pieces on each side of batten.

Square the positions of the sections across (on the top side of the pieces), also mark centre line. Take offsets from the half-breadth plan, and set off the breadth of water-plane on each section, and on each side of centre line; set off deck line in a similar manner. Pin the batten to offsets, and if same will not give a fair line, humour it by allowing it to pass slightly inside one offset and outside the next, taking care to adhere as closely as possible to offsets and to make both sides exactly alike, or the boat, when finished, may not look up-right.

Cut out the pieces roughly to shape, taking care to allow for the fall in or tumble home of the sides amidships, and the wood to form the propeller boss, which is 1/8" diameter at after end and dies away into the shape of the ship at about an inch or two forward of No. 1 section. After this has been done, take a small chamfer off top edges of pieces to the exact shape of the lines, and screw the pieces together again, taking care to keep the screws well clear of the sides, so as to avoid coming through the surface of the finished model.

Mark off templates for each section, as shown by body plan. These are to be made of thin pine. Cut the templates or patterns carefully to shape and take a chamfer off one edge, so as to leave a thin edge for application to the model. A penknife will be found most suitable for this work, as a spokeshave generally takes too much off at a time, and will not go into some corners.

All the tools for this work must be very keen, as to work huon pine cleanly requires a sharp tool. The superfluous wood may now be removed from outside of model by means of a spokeshave, paring chisels, and gouges, taking care not to go below the chamfers showing the water-planes and trying the templates at their correct position at intervals. After the model has been made to agree with templates and water-planes, and both sides are made ex-

actly alike, the pieces may be again taken apart and the thickness of hull marked on. The thickness is 3/16" full and is increased on floor, and at deck line and ends to 3/8". The inside can then be cut out with fret or compass saw, and the bottom piece hollowed out with brace and bit or gouge.

After this has been done, the pieces may be permanently fastened together with waterproof glue and wired together at intervals, the ends of the wire being twisted up on the inside on a small piece of perforated zinc. A screw may be put in vertically at the ends where the wood is left solid. Great care must be taken to put the pieces together in their correct positions, as on this depends the accuracy of the model.

The deck may now be fitted, and fastened to hull with 3/8" brass screws.

The keel-bar and stem is of brass, 3/8" by 3/16", in one piece, and fastened to the hull with 7/8" brass screws.

## Stern and rudder

The stern-post and rudder are brass castings. The stern post is 3/8" by 3/16" with a palm at upper side to affix to counter; this should be let in flush and have a 3/4" brass screw in each corner. There are two sheets of thin brass at foot to form a connection to keel and dead-wood; these may be let in flush or they would form a stronger if not let in, but chamfered on edges to offer little resistance to progress through the water. The hole to take rudder pintle should not be drilled right through the gudgeon, but should take all the weight of rudder on point of pintle. Before fixing the stern post, the hole for stern tube must be bored, care being taken to keep it in line with centre of shafting. The rudder is to be turned to 1/4" diameter at the upper part and the pin or pintle at the bottom is 3/16" diameter. The body of the rudder tapers from 3/16" at its forward edge to about 1/8" at after edge. A tiller may be fitted above deck on rudder head, and have cords leading to a wheel steering gear in the wheel screen. It will be wise to dispense with this, however, and let tiller fit into a toothed rack, leaving the wheel screen for the steam pressure gauge.

This would make a very satisfactory job if wheel screen is made portable, as steam pressure can then be observed without removing the boiler casing, and gauge will not be liable to damage from flame of the blow lamp.

## Stern tube

The stern tube is of copper or brass tube with an oval flange and brass gland at forward end. The lower piece of model is left solid to take this tube and the flange of same is secured to forward part of wood by two stout screws. At after end of stern tube a bush of lignum vitae is driven in tight and accurately



bored out to form a bearing for propeller shaft.

## Bulwarks

The bulwarks are formed by a solid block at each end, the intervening space being filled in with a long strip of sheet tin, supported by wood uprights or stanchions, which are let down through the deck and fastened to sides of ship, a cap piece of sycamore or other hardwood being fitted on top.

## Painting

The outside of the hull must have three coats of good oil paint, allowing each to dry thoroughly and sandpapering well before applying the next coat. Finally give a coat of boat varnish. The colours may be left to the individual taste of the reader, but red oxide below the waterline and black or lead colour above are the usual thing. Above decks the individual should follow his own ideas as to colour.

## The propeller

A good propeller is the next essential to a good working model and this should be very carefully made. Figure 1 shows the propeller which has a diameter of  $4\frac{3}{4}$ " and a pitch of  $7\frac{1}{2}$ ". It has three blades which, of course, are set at an angle of 120 degrees with respect to each other. The top blade in the figure shows the expanded blade or true surface, the bottom blade shows a projection of same and the centre one is a projection of blade lying horizontal, the dotted lines showing the pitch angles at various diameters. This propeller may be made by cutting three slots in the boss at the correct pitch angles and sweating the blades, made from  $\frac{1}{8}$ " thin sheet brass, bent and filed to the required shape, or may be cast in brass from a wood pattern, the former being preferable, particularly if the blades are silver soldered into positions. The right hand side of the figure is the forward or leading edge. The blades are  $\frac{1}{8}$ " thick at the root and taper to  $\frac{1}{32}$ " or less at the tip. All surfaces must be quite smooth and the edges must be sharp.

The surface of the blade must be true on the driving side, except that the back edge may be slightly rounded, so as to allow the water to leave the edges as smoothly as possible and all the rounding must be on the back surface.

The shaft for the propeller is  $\frac{5}{16}$ " diameter silver steel, and the propeller may be fixed to a tapered square on the shaft. This square must be filed up from the shaft, i.e., the shaft will be  $\frac{5}{16}$ " diameter at the forward end of the boss of the propeller, tapered to full  $\frac{1}{4}$ " square at the after end; the screwed part aft of this is  $\frac{5}{16}$ " long and is threaded  $\frac{1}{4}$ " Whitworth thread, preferably left handed.

## Funnel

The inner and outer funnels should be made of brass tube. The cravat etc. being flanged up from sheet brass or copper. Choice of colour is again left to the reader but black is most usual and serviceable, as excellent heat

resisting black paint is now available. The inner funnel should be left sufficiently long to slip over the top of the smoke box at a later date, while the outer casing is flanged for attachment to the deck.

## Boat speed

The speed of the boat should be about four miles per hour with the engine which will be described later, and she should tow a skiff at a fair rate. Four miles per hour is very good for a boat of this size as the average speed for the full size tug would be about 15 knots maximum.

## Deck fittings

The deck fittings on the model will be left to the reader. They are all clearly shown on the plans and elevations and it is a matter entirely for yourself as to whether you build up the deck houses from sheet metal or wood. Whether you buy your bollards, anchors, winches, etc., ready made, or fabricate them yourself. There is nothing difficult about any part of the design, which has been worked out to provide a model having all the atmosphere of a large tug, good hull lines, and simplified construction.

## Fitting out

The model is of no particular ship, but is a combination of the best features, from a modeller's point of view, of three or four vessels. The upper works follow closely the design of a powerful tug built for a New Zealand firm a few years ago, while the hull is similar to that of a twin screw vessel in use in South Africa, with suitable adjustments to displacement for modelling, and for single screw working.

## Engine

The engine recommended for this hull is a twin cylinder marine type, either 1" x  $\frac{7}{8}$ " stroke, or a compound having cylinders  $\frac{3}{4}$ " x  $1\frac{1}{4}$ " x  $\frac{7}{8}$ " stroke. The construction of both the above will be described, so that the reader may take his choice. The weights of both the above engines will approximate four pounds, so from that point of view the one chosen matters little. Actually the compound will be a little heavier.

## Boiler and blowlamp

For a boiler for this type of vessel it is difficult to better the single flue launch type, fired by a blowlamp. The blowlamp has many disadvantages, probably the major one of which is the tendency of the burner to choke, but it is by far the most convenient means of obtaining the necessary heat continuously.

Getting back to the boiler, we require one having an outside diameter of  $4\frac{1}{2}$ ", length 9", centre flue 2 $\frac{1}{4}$ ". The weight of such a unit, water included, would be about 7 lbs. so we must add this weight to that of our engine. Now comes the blowlamp, and in this case our weight will be about three pounds in running order. So we see that we have to carry a weight of fourteen pounds for plant, and to

this should be added about two pounds for piping, pump, and fittings, our total plant weight becoming sixteen pounds.

## Displacement

If we place our hull in the water and weight it to the extent of sixteen pounds, we can then place extra weights in the hull until it sinks to the Load Water Line (LWL), and thus we have a guide to the weight we may take up in superstructure and deck fittings.

Actually, we should have an ample margin for ballast in the model, as even a coarsely made hull should not exceed twenty pounds in weight, to which is added the sixteen pounds already allotted for power plant, giving us a total of thirty-six pounds in all, while the calculated displacement is sixty-two pounds, or actually a little over, so that ballast and fittings, etc., may weigh twenty-six pounds.

## The main deck

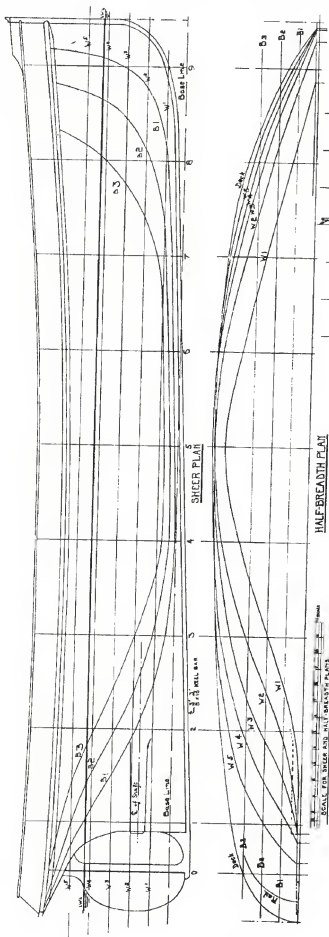
Many model steamer builders make the mistake of constructing the deck of the vessel of one piece of wood, the result being that after a few trips, cracks begin to appear in the surface of the deck, owing to the heat on the underside and water on the upper surface. The deck is confined by the bulwarks, and it is unfortunately true that timber, when damp, expands; conversely, when heated, it contracts, and the simultaneous application of damp and heat is fatal to the one piece deck, which being confined in latitude and longitude, is forced to expand in an upward direction. Result, unsightly buckles and subsequent cracks. We will, therefore, profit by experience, and make our deck in sections.

It is far easier to allow the decks to overlap the hull, afterwards trimming off the overlap to form the top of the rubbing strake, than to laboriously fit the deck to the inner side of the hull.

The best material for the decks is  $\frac{1}{2}$ " thick yellow pine, but this is unfortunately practically unobtainable, and the next best thing is sugar or Huon pine.

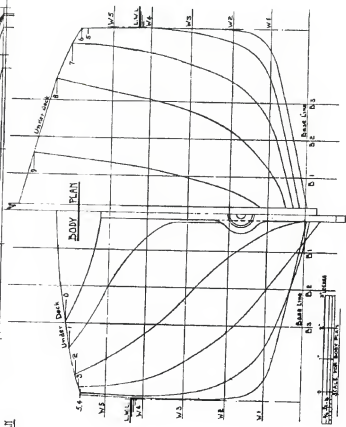
## Preparing the deck sections

Having procured our board, which should measure 5ft by 1 ft, and have a thickness of  $\frac{1}{2}$ ", we cut off a piece 1 ft long, which is to be fitted to the forward end of the hull. Carefully square off, plane and sandpaper the sawn edge, so that it will fit closely to the next section, place your square on the sawn edge, and mark the centre line on your deck piece. Place the timber on the hull, making sure that the centre line coincides with the stem piece, and mark on your deck the position of the stem, afterwards cutting the deck away so that it fits around the stem, and the sawn edge is exactly eleven inches from the outer or front edge of the stem post, the sawn edge being also exactly at right angles to the centre line of the hull. Now screw the deck piece down to the sides of the hull, using  $\frac{3}{4}$ " No. 6 brass countersunk head screws, and making sure that the screws go evenly and centrally into the hull. Space the screws at intervals of about two



HALF-BREADTH PLAN

SCALE FOR SHEER AND HALF-BREADTH PLANS



BULKHEAD SHOWING THICKNESS OF ASSIST-  
BLIND LIFTS - NOT TO SCALE



# **OCEAN-GOING TUG** HULL LINES FOR A 4' 6" MODEL

inches, and screw in until the bottom of the head just touches the deck. Having placed all the screws in position, take out the second screw from the after end of your piece of deck, and, using a  $\frac{3}{16}$ " drill, open out the screw hole for a depth of a little over  $\frac{1}{4}$ ", but not  $\frac{3}{16}$ ". This operation requires some care, as it is necessary to have the hole sufficiently deep to carry the screw head far enough down to clear that portion of the deck which we shall shortly plane off to give us the correct deck camber, yet we must not go far enough to weaken the deck at the point of attachment.

Having made our countersink, we replace the screw and proceed to countersink all the others in the same way, taking out one screw at a time, and replacing it before going on with the next one. A somewhat laborious process, but well worth the trouble to ensure a nice job.

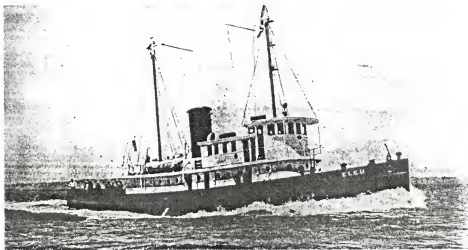
We can now proceed to the second section of the deck, and for this we require a piece of our board  $17\frac{1}{2}$ " long. Both ends of this piece must be carefully squared off, planed and sanded at the edges, so as to butt up closely to the adjoining sections. Proceed as before, centre line, fit, screw, countersink and replace screws as you go, and so on to the next section, this being 13 inches long. Same procedure, and on to section four, which is only nine inches in length, and the final stern section, six and a half inches in length. This latter piece will project over the stern in a similar manner that the first piece did over the stem. Having all our deck sections screws into position, and screws properly countersunk we proceed to trim off the edges of the decks to the outline of the hull. This can be seen from the drawing, and the projection of the deck from the outer side of the hull, to form the top portion of the rubbing strake, is  $\frac{3}{8}$ " all around the hull, except of course, at the stem, where the rubbing strake runs off into the stem.

## Deck beams

Having shaped our deck as outlined above, the next step is to fit the deck beams and coamings.

Deck beams first. These should be of  $\frac{1}{2}$ " x 1" timber, and we shall require eleven of them, the lengths varying from seven to eleven inches. They are screwed to the underside of the deck sections, the screws being the same as used to fasten the deck, and the holes countersunk as before, except that the midship screws need not be so deeply countersunk as those nearer to the sides of the hull. For these beams to be fully effective in supporting the deck and preventing movement, accurate fitting is necessary, and again we will find that the long way round is really the shortest.

To make a start, we remove all sections of the deck except the bow section, which we will call No. 1, afterwards referring to those sections following it towards the stern as Nos. 2, 3, 4 and 5. Now, using a sharp pencil, mark the underside of No. 1 deck section by running the pencil closely around the angle formed by the underside of the deck and the



*This photo wasn't in the original articles, although it is a poor photo it has been included to provide a pictorial view of a tug along the lines of the subject of this article.*

*A typical American tug differs entirely in design from a British tug. The superstructure of British tugs are made as small as possible and towing hooks are placed amidships. The Eleu shown above has a long superstructure and the towing hook is placed well aft. A vessel of 335 tons gross, the Eleu has a length of 116ft 6 in. and a beam of 28feet, with a depth of 14ft 4in.*

inside of the hull. This will have to be done carefully, as it is important that the line shall indicate to us the exact point of junction between the deck and the hull. Having done this, and made sure that we really have a pencil line on the underside of the deck, and not merely a light scratch, we remove the deck section and turn it over on the bench.

We have already marked a centre line on the deck's upper surface, and another centre line should now be drawn on the underside, but be sure that the two lines coincide. Place the square on the underside of the deck, and at a distance of  $2\frac{1}{8}$ " from the wide end, draw a line across the deck from the centre line to the outside. At  $\frac{1}{2}$ " nearer to the bow draw another line parallel to the first one, afterwards reversing the square, and carrying the lines through to the other side of the deck.

Now coming back to the wide end, draw a line parallel to the edge at  $\frac{1}{2}$ " from it. These lines give us the positions of the two deck beams under deck section No. 1, and the intersection of the lines we described before removing the deck gives us the exact lengths of the beams. We can now cut two lengths of our  $1" \times \frac{1}{2}"$  timber to fit, cutting the ends at the angles indicated by the intersecting lines; and screw the beams to the underside of the deck section, afterwards carefully fitting the ends of the beams to the inward slope of the hull, should this be found necessary.

We may now place section No. 2 in position again, securing by means of the screws, and repeat the process of marking the underside of this section. Remove, place upside down on the bench, and at  $\frac{1}{2}$ " from each end draw pencil lines across as before.

Half way along this section draw two lines across, these again being half an inch apart, indicating the position of the centre beam, the lines at the ends, of course, are a guide for the two end beams.

Beams at the ends may now be secured to the underside of the stage. Sections 3 and 4 should be treated in a similar manner, each having cross beams at the ends only. Section 5 has only one beam, this being, of course, at the squared end.

## Positioning longitudinal supports

Having all our beams secured, we now require a support inside the hull on which they may rest, and we adopt the following method of finding the position of the longitudinal supports, which will run along the inside of the hull fore and aft. We again place section of deck No 1 in position, put in two or three screws to ensure correct placing press firmly down, and again with a sharp pencil, mark the positions taken up by the lower edges of the beams on the sides of the hull. Repeat this process with all sections until we have a series of marks along each side.

We may now screw a  $\frac{1}{2}" \times \frac{1}{2}"$  batten along the inside of the hull, with its top edge registering with the marks we have made, and if our marks have been truly made, the batten should touch each of them. The necessity for accuracy will be apparent here, as if we have our battens or stringers too low, they will be of no use to us as a support for the beams, and packing will be necessary, whereas if too high, they will have to be cut away. This latter may be necessary at the forward and after ends of the stringers, as they will tend to rise there owing to the twisting needed in fitting them to the hull. To do this it is only necessary to place the decks in place and cut and try until the beams bed truly.

## Cambering the main deck

Now we come to the planing of the camber on the decks, and they should all be screwed in position, all screws being well and firmly sent home.

The decks are left the full  $\frac{1}{2}$ " thick amidships, and at the sides they are planed off to  $\frac{1}{4}$ " the increase being gradual, of course. Draw a pencil line right around the edge of the deck,  $\frac{1}{4}$ " from the top (or bottom), and this will act as a guide for the finished thickness. Don't press downwards too hard while planing the deck, and if a screw appears to be too near to the surface, take it out, drill down the hole a little and replace the screw.

## Main deck openings

When you are satisfied that your camber is right, sandpaper the whole of the upper surface, and mark out the sections for the openings.

Section No. 1 requires a hole  $3" \times 2"$  for the hatch. Section No. 2 is cut away for the whole of its length to a line drawn  $\frac{1}{4}"$  inside the lines marked "housing on main deck under". The beams are not cut through, of course, and probably they had better be removed during the cutting process, but this is not necessary if care is taken.

Section No. 3 is cut away along a line drawn  $\frac{1}{4}"$  inside the line of the engine casing, giving us an aperture  $9\frac{3}{4}"$  long by  $6"$  wide. Take care not to cut away that portion of the deck marked "towing hook" on the half deck plan. It should not be necessary to have an aperture in either sections 4 or 5, as the stern tube gland will be just forward of station 2, and therefore will be easily accessible from the engine casing aperture.

## Nomenclature

Referring to Figure 1, we will just run over the entire model in a review of the work to be done. By going over these items in this way, the uninitiated reader will become familiar with the names of the various fittings, so that he will easily recognise them when referred to in future.

Starting at the bow, or stem, as it is sometimes called, we have the stem post, which is, of course, already built into the hull. Fastened to this and to the rubbing strake is the bow fender, which is used to protect the stem post when the tug is "nosing" a vessel into its berth.

Immediately behind the stem post, and within the bulwark, is the forward mooring post, then come the bollards, also used for mooring purposes, and fitted to both port and starboard sides, as are the anchor raising derricks, which appear immediately aft of the bollards.

Aft again, we find the windlass with its deck plates and chains running down the hawse pipes, through the hawse holes, to the anchors, and behind the windlass is the forward hatch, with another pair of bollards, one each side of the deck. Then come the two forward vents, one each side of the hatch, and mooring posts are fitted port and starboard as shown.

By the way, it is surprising that many people are not aware of the fact that the Port side is the left, when standing on the bridge facing the bow of the ship, and that the Port navigation light is red, the Starboard, or right hand navigation light being, of course, green.

## Upper decks

We have now arrived at a point where the upper deck covers the main deck, and here will be seen two deck lights, or circular windows let into the deck for the purpose of admitting light to a lower deck; between these lights the mast rises, this being fitted with a single derrick and the usual lights, signal halliards, etc. Now comes the main deck structure, which covers the boiler space, and on this structure are erected the upper deck houses, wheel house, bridge, funnel and funnel casing, fresh water tanks, ventilators and lifeboats; while at the after-end the towing hook may be seen.

The whole of this unit should be made so that it may be removed in one piece, thus giving easy access to the boiler and blowlamp with a minimum of trouble in removing deck fittings. Aft of the upper deck are two more mooring posts and two deck lights, and immediately aft again comes the engine casing, the top of which is fitted with "lights," or windows, as shown. The engine casing is also removable for easy access to the engine. Now come the towing beams, or towing bridges, as

they are variously termed, the purpose of these items being to carry the tow rope clear of the after deck. These, together with the deck house below them, are also removable. Port and starboard after vents, another deck light, the towing winch and a hatch bring us to another towing beam, and aft of this again are more bollards, port and starboard, a scuttle, a grating covering the tow line stowage space, and, outside the hull, the after fender.

This completes our list of deck fittings, with the exception of those on the bridge, and reference back to this part of the vessel shows that on the bridge itself we have two engine room tele-

graphs, and the port and starboard lights, and in the wheelhouse, of course, we would find the steering wheel and binnacle, or steering compass. Another binnacle is found on the flying, or upper, bridge.

## Finishing off

The main decks are finished to represent steel plating, as they would be of this material in the prototype, while the upper deck is planked.

The top of the funnel casing would be of steel, painted red oxide or black, with gratings, or "Fiddies" set into it as shown, for the purpose of ventilation. The bridge is planked in the same manner as the upper decks, while the flying bridge is canvas covered and painted.

## Editor's update

*The model as just described is a fairly large one. The method of building the hull is fairly archaic by today's standards. Plank-on-frame would be the preferred method today.*

*By scaling down the model slightly, you could end up with a model of similar size to the now common 1:24 scale models of modern tugs of which there are many examples. In doing this, one of the many commercial steam engines of around the  $\frac{5}{8}" \times \frac{3}{4}"$  bore and stroke such as a Stuart Turner 10V would be suitable and a boiler to suit,  $4"$  diameter  $\times 8"$  long centre flue type. Firing the boiler would be by Butane gas. A suitable type of burner is described in AME March-April 1997 commencing on page 28.*

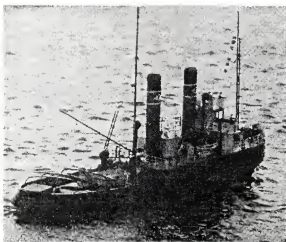
*Reference to Jack Henshall's recent series on Marine Plant in AME, Part 1 - May-June 1995 from page 39 and Part 2 - July-August 1995 page 38, gives a good account of matching of steam plant to hull size and use.*

*For a tug with the described shafting arrangement, Lignum Vitae timber is now unobtainable. So a conventional sterntube with a phosphor-bronze bush at each end would be suitable and with a conventional stuffing box (sealing gland) on the inboard end.*

*Huon pine is still available, a good source is a timber yard in Strahan, Tasmania. You could try the Tiny Timber Yard for the smaller pieces.*

*For the 1990s marine modeller, varying the colour scheme no longer presents a problem. A wide range of colours is now available for marine models. Also heat resistant paint in a range of colours is now available from automotive spares outlets.*

*Radio control would be used to control all of the required plant functions. ... ed.*



Another example of an ocean going tug.

# Building an Astronomical Telescope

## Part 2 — General Requirements for a Newtonian Telescope

by Doug Shaw

*Drawings for publication by Dave Adams*

Part 1 touched only on the essentials relating to the broad types of telescopes available for amateur telescope making, namely refracting and reflecting telescopes.

In more recent times a third type has emerged. This is known as the catadioptric telescope. This employs both lenses and mirrors to bring the image to the eyepiece and is physically shorter than refractors and reflectors. It is more sophisticated to manufacture and hence more costly and is generally beyond the scope of amateur capacity. For all practical purposes a simple reflecting telescope is more than adequate. The reader will recall from Part 1 that this is a lot cheaper to make than the refractor and suffers fewer inherent defects.

Newton's telescope is to this day the simplest and best general purpose telescope available. Since our telescope will be a Newtonian reflector it is now necessary to examine the arrangement of the optical components of this system.

Figure 6 shows the general arrangement of our Newtonian telescope. We can see now that the light from the primary mirror is reflected back up the support frame (be it a tube or some form of open framework) to an elliptical diagonal flat mirror arranged on its support at 45 degrees and placed symmetrically across the principal axis. The cone of rays is thus turned at 90 degrees and brought to a focus just clear of the telescope support frame where the image so produced can be examined by an eyepiece.

At first glance placing an obstruction in the telescope support frame seems rather counter productive and certainly some incident light is blocked, however the mirror axis of an elliptical diagonal mirror needs only to be about 1/5 the diameter of the primary. This results in about 95% of the incident rays still reaching the primary mirror and is thus a very insignificant defect.

The next question to consider is the size of our telescope. Here practicalities take over. Unless an elaborate project with a small observatory building is planned, portability of the instrument is important. In all probability the end product of our labour will have to compete for space with the furniture when not in use.

A browse through the showroom of a supplier of optical equipment will probably reveal a range of refractors having lens diameters up to 75mm or 100mm. The larger sizes being about 1500mm in length and have extremely discouraging price tags.

A 100mm reflector would be only about 20% of the cost of the largest refractor and be significantly shorter (this telescope would require a mirror of spherical curvature only). As we are going to make our own mirror however, a much more powerful instrument would be one with a 150mm mirror. It is well worth attempting since it is easier to handle a mirror blank of this size notwithstanding that it will require slight parabolizing (note also that the light grasp of a 150mm mirror is over twice that of a 100mm mirror as it has over twice the area of the smaller mirror).

Having decided on mirror diameter, the next consideration should be its f-number, which from Figure 3 (Part 1) is equal to mirror focal length/mirror diameter ( $\frac{f}{D}$ ).

We have already seen that the typical f-number of a refracting telescope of  $\frac{f}{15}$  or thereabouts restricts its photographic capacity and leads to a rather long tube.

For convenience a length of the order of 1000mm might be a good compromise for the support frame for our telescope whether it is a tube or an open framework. A useful f-number for general purpose astronomy would be  $\frac{f}{8}$ .

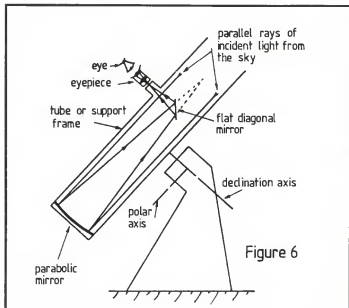


Figure 6

According to the formula  $\frac{f}{D} = \frac{f}{D}$ , the focal length would be 1200mm which is manageable and there will not be too much glass to remove to form the concave mirror.

The actual length of the telescope will depend on the final focal length of the mirror, which depends in turn on the precise depth of the concave mirror surface at its centre. A very small inaccuracy here may cause a consequent variation of 100mm or so in the mirror's focal length. Any such inaccuracy is no reason for discarding it in the end after spending many hours of work producing an otherwise beautifully accurate and perfect surface!

Perhaps at this stage it would be as well to take stock of the optical components needed to build the telescope.

1. Firstly of course, the mirror. Two 150mm diameter, 25mm thick pyrex glass blanks are needed. One becomes the tool and the other the mirror (sometimes suppliers will refund some of the cost of a used tool provided it is returned in good condition).
2. One elliptical diagonal mirror with a diameter of 32mm.
3. Several eyepieces about which more will be said later.
4. A finderscope. This is a small refracting telescope of low power with an objective lens of diameter between 16 and 25mm and an eyepiece fitted with cross-hairs illuminated in some way so that they are visible against the blackness of the night sky.

The amount of time first spent acquiring the skill to manufacture items 2, 3 and 4 and then making them, strongly suggests that they be purchased.

We are now ready to procure the mirror blanks. These must be warranted fully annealed so that there are no unrelieved stresses in the glass to produce distortions of the surfaces as work proceeds. As the mirror's diameter is 150mm the blanks must be somewhat oversized and have a generous 45 degree chamfer ground around the full circumference of both sides to ensure that they cannot become chipped during working. The surfaces of each should also have a good degree of parallelism and flatness.

By now the reader will be wondering how the required concave shape of the mirror surface is obtained. We have already seen how a spherical hollow is very near the one required so this is the initial aim.

If some thought is given to how glass may be shaped it will be obvious that grinding would be a necessary procedure and that cutting paste, pressure and relative motion between the glass to be shaped and some other solid surface would be required. Some further thought will reveal that in a grinding process where two surfaces are rubbing past each other in intimate contact, only two geometric shapes can be generated, one being two planes and the other two spheres of equal radius. Now it is difficult to produce plane surfaces and fortunately easy to generate spherical surfaces. In effect all that is necessary to produce a spherical surface is to deliberately set out to spoil a plane!

In applying all this to our present task, our grinding paste is made from special cutting grits and water and the two surfaces in contact are one side of each of the blanks. One blank becomes the mirror and the other the tool.

We need now to determine the depth of the sagitta (the depth of the concavity of the mirror to be) to meet our design criteria. Figure 5 (Part 1) shows that the radius of curvature equals twice the focal length of our mirror.

The formula  $R = \frac{f^2}{2c}$  approximately connects the radius of curvature  $R$  with mirror radius  $r$  and the required mirror depth or sagitta  $c$ .

Therefore  $c = \frac{f^2}{2R}$  where  $R = 2 \times \text{focal length } f$

Thus for our mirror diameter 150mm and focal length 1200mm:

$$c = \frac{75 \times 75}{2 \times 2400}$$

$$c = 1.172 \text{ mm}$$

The mirror blank and tool must be worked on a very rigid support and this should be accessible all around, at a comfortable height above

the floor and rigid enough to resist considerable downward and sideways force applied by the worker's hands. In days of yore, a barrel was often used as a support. In these days of more sophisticated brewing methods a steel column, say 100mm diameter rigidly bolted to a concrete floor and with a thick round top covered with formica should be used, although the writer's experience with a solid bench accessible from one side only has been satisfactory if not as convenient.

The mirror and tool must be placed one above the other on the support and the lower disc secured with three wooden cleats arranged at 120 degrees around its circumference, which are just sufficiently slack to allow its partial rotation. As sometimes it is necessary to alternate mirror and tool it may be necessary to make one cleat adjustable to properly secure the lower disc in the event that mirror and tool have slightly differing diameters.

It will be almost inevitable that the would be telescope maker will gravitate to a supplier of telescope construction material for his blanks. He will also find there kits for mirror making including from five to seven grades of abrasive material ranging from coarse to extremely fine grain size, and also polishing materials and specialist books on telescope construction.

A textbook at this stage would be highly desirable since an overview will not provide sufficient details to necessarily insure success. No doubt advice will be available from the stockist. I have found *How to make a Telescope* by Jean Texereau (Willman-Bell, Inc. ISBN 0-943396-04-2) extremely comprehensive and invaluable.

I would suggest that reference to your telephone directory under the heading "Astronomical Supplies" should produce a number of suppliers of everything necessary to build and use an astronomical telescope.

*To be continued...*



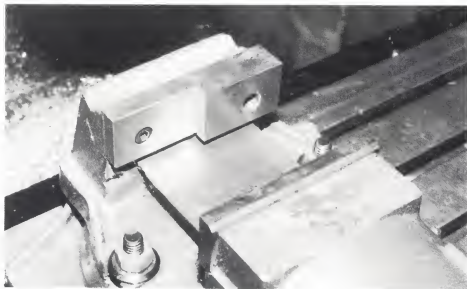
## Vice Square

by Max Rendell

When you try milling blocks, locomotive frame stretchers, axleboxes and the like they need square faces for reliable service. Usually it is not a simple matter to ensure perfectly square faces every time. But with this simple method accuracy is quick and easy.

You need to be accurate only once. Make up a false jaw for your milling machine vice as shown in the photo opposite. Use sizes appropriate to match your particular vice.

Once you have accurately mounted the false jaw on the fixed jaw of your vice simply butt a flat edge of your material against the vertical face of the jaw and machine the top face of your job.



## Shop Hint of Peter Dawes

Socket headed screws are a pain. Those on the table of the Taiwanese bandsaw RF 115 are especially so because metal dust fills the holes up within minutes of starting to saw. I discovered that the two screws can be replaced by slotted countersunk 1/4" W screws with no retapping.

To clean out the rubbish just wipe the blade of the screwdriver sideways in the slot.



## Cylinder Machining Tip

by Alex Russell

You've bored out your locomotive's cast iron cylinders with a single pointed tool but, if you had a strong enough magnifying glass you'd find on inspection that the bore would look like a ploughed field!

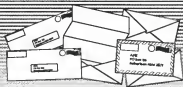
An easy solution is to get yourself a cheap cylinder hone from a car accessory shop. Put the hone in your bench drill chuck and set the slowest speed.

Anoint the bore with kerosene, get the stones inside the bore before starting and carefully run the cylinder up and down the whirling stones for about five minutes.

You should finish up with smooth parallel bores.



# Letter Box



## IC help

Sir,

In the Jan-Feb 1997 issue 70 AME, there is an article on two internal combustion engines by Paul Duttan.

I have some information and a request, Paul wants cheaper spark plugs try CM-6 NGK 10 x 1.0mm from a Honda motor bike shop and the request is, any chance of getting a copy of plans for the carburettor for the 50cc engine?

I am designing a twin cylinder water cooled horizontal internal combustion four stroke, and looking for a carb that will fit the design.

Owen Mesken

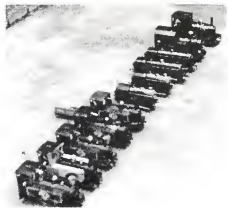
Qld.

## A garden loco collection

Sir,

Congratulations on the quality of the AME. I was interested in the article entitled *Tracks and Trees* in the last issue and am enclosing a photo of some of my live steamers that I ran outdoors when living in NSW.

We moved to Herberton late last year and have not as yet been able to set up any outdoor track but we do have an indoor set up nearing completion, using O gauge track.



Reading from the bottom of the photo, we have five Mamods, two of which are gas fired and one is fitted with radio control. The next four are Maurie Haynes' excellent models. The next engine is an internally gas fired locomotive made by Beck Kassell and lastly a model made by the Merlin Company in Wales.

I bought the Merlin engine *Mayflower* while holidaying in Britain in 1995 and have found it is more likely to "flower" than to run.

I would be interested in hearing from anyone who has a Merlin Engine, running or not.

I have another three steamers and a collection of clockwork still to be unpacked.

I may shy away from a ground level track this time, though they are realistic, and go for something built-up, which will be far kinder on the back.

Eric Egan

Qld.

PS Where can I get a copy of *Rails in the Garden*?

*I'll pass on your request to the Editor of Rails in the Garden... bmc.*

## The Trunk Engine in WA

Sir,

I am sending you my completed "feed-back" questionnaire. I really enjoy the magazine, its first class.

While looking through past issues I noticed in issue 67 (which I must have not read in great detail when it arrived) on page 19-20 some details about a trunk engine, and the fact that one was salvaged from a wreck off West Australia.

I was in the Fremantle Maritime museum a few years ago and recall seeing a display on this subject complete with a model of the engine in a glass case.

It did mention that they had great trouble sealing the glands and that when the stuffing boxes (I assume) were tight enough not to leak there was so much friction that there was considerable loss of power.

Julian Breen

Vic.

## Hales Creek memories

Sir,

I have just received the Jan-Feb issue of AME and have read with interest the article on the Hales Creek Railway.

Some forty plus years ago I visited this Railway with my family as my father was an acquaintance of Wally hale and these visits usually took place on trips to Ferntree Gully to see our Grandmother when we kids could persuade Dad to call in on the Hales. The location of the railway was on the northern side of Burwood Highway, halfway between Middleborough Road and Blackburn Road, East Burwood (Melway Map 61 H5 Hale Court).

I can still remember the place quite well. As you entered down the driveway you came

to a rail crossing, the line coming out of a cutting on the right hand side, crossing the drive and immediately entering a station yard with sidings. The land at this point fell towards a creek so that a natural transition took the track on a siding to an elevated turntable which fed an engineshed with, if memory serves correct, only five elevated roads in it. On all visits there was always five locomotives inside and from what I was told each of the four people who ran the railway had an engine and they had all built the fifth engine together. Unfortunately I have no recollection as to wheel arrangement of details of them. Back on the mainline it departed from the station onto a trestle bridge which took it through a 180 degree curve and into another station once it was back to ground level. Departing from here it crossed the driveway into the cutting which took it in another 180 degree curve to re-appear where we first saw it. Once again, if memory is correct there was also some form of signalling at the stations and offhand I would say that the whole railway covered an area of about a quarter to one-third of an acre. Because we were never able to get there when the locos were running we never rode behind them on the railway, we were however allowed to push each other around on the rider trucks which was at the time great fun as long as you had cleared the flangeways on the driveway crossings. The only time we rode behind the locos was at the Model Engineering Exhibition at the Exhibition Building in Melbourne in 1953 or 4 when all five locos were run on straight lengths of track laid on the floor in the annex off the main hall. Each engine pulled rider trucks carrying the public and would shuttle backwards and forwards as distinct from the live steam club (Surrey Hills?) that had an elevated circle of track in the main hall.

I hope you and others will find this of some interest and maybe there will be others can add more details.

Ewen L. Stevens

Vic

*More letters on the next page...*

## Letterbox Contributions

Contributions of letters by mail to: PO Box 136, Robertson, NSW, 2577 or fax to: (02) 9646 1362 are very welcome.

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion — as long as they are not libellous — will be considered for publication.

Please **type** or **clearly print** your letters, as script is often difficult for the typist to interpret.

The Letterbox is a popular medium of expression, so space is limited. Therefore, letters of 400 words or less will have a better chance of being published.

bmc

# News Desk



compiled by Brian Carter

## Welcome to another edition of AME

I've just returned home from the annual AALS convention held at Cobden in Victoria. I'm sure all the delegates had a great time, I know I did! Congratulations to the people of Cobden for a remarkable achievement.

I'll leave it at that for the moment, a full report will appear in the July-August issue.

The 1998 convention will be held by the Castledare Miniature Railway club in Perth WA. 10 to 13 April. I'll keep you posted when more details are known.

Does anyone have any contacts in the transport business that could arrange bulk transport of locos from each of the eastern capital cities at a reasonable cost?

## Future items

We have several construction articles in the pipeline. One is a simple battery-electric tram engine — ideal for the grandkids! We have a delightful model of a standard Weir pump, unlike the prototype, the model works very well! Finally, a major construction article of epic proportions — a 5'g 0-6-0 Fowler loco called *Eudlo*. Another project in embryonic stages is a 5'g South Australian 710 class loco. We are negotiating a simple 7¼'g

loco. Unlike the 422 class project, all our construction articles will now be complete before publication begins. This way we will avoid the embarrassing errors discovered "down the track". The *Eudlo* project will be published as soon as we can, but it will probably be a year away at least. There are hundreds of drawings to do. Due to the complexity of the project the series will probably go longer than the 422 class loco — we want to make it easy for beginners to have a go.

## AME Index

This elusive (and massive) project is finally nearing completion. The index will be published in January 1998 as a 10th Anniversary commemoration and will be complete up to November-December 1997. It will be published in an A4 size, magazine style. The entries will be too expensive for taking up space in regular issues of AME.

We hope to continue with annual index sheets after the initial release.

## Readers survey

My sincere thanks for all those readers who took the time to return the reader survey form in the January-February issue. An overwhelming number asked for an Authors Guide, please be patient, we'll get them to you

## A plea for garden rails

Sir,

I am a first issue reader of the type to which you referred in your recent editorial. Having recently moved back to Australia after a three-year stint in Colorado, where I developed an interest in garden railways, I was hoping that your magazine could be of some assistance in matters related to Gauge 1 live steam in Australia.

On the rare occasions that the SASMEE park's open days coincide with my infrequent trips to Adelaide, I never fail to attend and marvel at the larger gauge equipment. Perhaps I might have an opportunity in retirement to own such a marvellous locomotive, but I must restrict myself to smaller engines at this time.

You might be interested to know that I found it very difficult to obtain a copy of AME at even the largest newsagents in Adelaide.

A single copy was available in Port Augusta. Either it sells out quickly, which is no doubt very good for you, or it is not getting sufficiently wide distribution. I recently sub-

scribed to ensure that I get a copy.

We are making progress with the collating and some interesting trends are emerging. Obviously the trend will change as more surveys are added. However, as things stand at the moment, there is a tremendous support for the magazine in general. The average age of our readers is currently at 55.6.

Question 16. Are you in a Model engineering club? Provided a response that will change my way of thinking, at this stage of collating 40% are *not* members of clubs. The figure has not varied very far all along so it may not be very different at the end. This means that more readers are not getting support from other people than I had imagined. We will need to cater more for the "loner".

I hear your screams for more hands-on projects. Anybody want to write some?

I'd like to have all the returns in by the end of May, so if you are still thinking about it get it filled in and post it straight away!

## Minimum boiler size

The article *A Butane Burner and Boiler* in the previous issue, on page 28, made a statement about the minimum size of a boiler to come under the AMBSC Copper Boiler Code. The statement was *not exactly* correct.

AMBSC have advised AME that the minimum size covered by the Code is 50mm diameter.

To be exempt from the Code: the boiler must be *less than* 50mm (1.968") diameter and *less than* 1 litre water capacity and *less than* 250kPa (36.26psi) pressure. Note that *all* three of the criteria must be satisfied to be exempt from the AMBSC Code. AME apologises for any inconvenience caused.

## Trade and Commercial

Don't forget the May sale at Hare & Forbes Parramatta. See Coming Events for details.

*Letterbox continued...*

## Injector consumption

Sir,

Measuring steam consumption of an injector. A satisfactory method is based upon the nozzle characteristic that if the pressure at the exit is less than the throat pressure which is about 58% of the input pressure then the steam flow is unaffected by the exit conditions. Therefore the injector with its steam pipe as its only connection can be immersed in water in a suitable container and the weight gained by the condensation of the steam in a timed interval equals the steam consumption.

Sufficient water is used (two litres is sufficient for 30 seconds of steam flow into the ordinary size model injector) to ensure complete condensation and that the water doesn't splash over the sides. A few dummy runs are made to check for any variations due to trapped water or drips or dribbles from the bits and pieces. The ball valve and delivery cone can conveniently be removed for this test.

Ted Crawford, SA

scribed to ensure that I get a copy.

Even though my father-in-law was a machinist, and I learned to use all of the common metalworking machinery as a consequence of my degree in mechanical engineering, I am unlikely to do any serious machining here in the outback. My interests are more in the use of fully built models.

Thank you very much for inviting me into the hobby. If you have any advertisers of small locomotives (Brandbright Limited, perhaps?) I will be more than willing to support them.

William H Hanna, SA

*Thanks for your support William, have a look at the ad for Argyle Loco Works on page 4 of this issue... bmc*



You can also email your letters to:  
B.Carter@edfac.usyd.edu.au

## Classifieds

### 32 Class Chassis for sale

- 5" gauge running chassis complete but for coupling and connecting rods with castings and drawings \$2800 ONO. Ph. Graham (049) 84 1774

### Magazines for sale

- Model Engineer, Railway World, Model Railway News, Model Railway Constructor, Practical Woodworking, The Woodworker, Fine Woodworking, Classic & Sportscar, Thoroughbred & Classic Car. Enquiries Joe Stead (02) 9449 7011

### 7 1/4" gauge Diesel look alike for sale

- Professionally built along the lines of a NSW 41 Class. Powered by a 9HP Honda petrol motor in turn coupled to a hydraulic pump, powering a motor attached to each axle (4). Riding truck is fitted with Air Brakes. The loco is new and is currently undergoing track test, having so far hauled 38 adults at max speed of 10 kph. Powder coated in gold yellow. Ideal as a Club loco. Sell for \$22,000 ONO. For further details Ph Stan Kirk (07) 5524 5444

### For sale

- 5" dia copper tube 1/8" thick 37" long \$300, and Stuart turner V10 castings \$200 Ph. Peter (02) 9634 1662

### Two 12" gauge locos for sale

- 1 complete, 1 minus tender but with bogies, wheel sets, and bogies. Diesel chassis and motor 14lb rail to form circle approx 80" in diameter. Other items for 12" railway included, stored for 10 years sell in total \$10500 ONO. Please call John (07) 5494 1191 or (02) 9528 9316

### Sell or swap 1/4 scale steam roller

- About four feet long. Twin cylinder, coal fired, based on Aveling & Porter. Goes well, copper boiler has certificate all the hard work done \$5000 ONO or swap for larger marine engine. Any enquiries welcome. Ph. Geoff (02) 9520 3743

### 7 1/4" gauge portable track for sale

- Ideal for the back yard. \$1000. Ph. Bob Brown (09) 399 1902

### Battery powered 5" gauge model for sale

- Loosely based on the GWR's version of the Sentinel Petrol Shunter with matching bum cart. This is a well made model and operates extremely well. Open to reasonable offers. Ph. John (069) 24 5229

### 7 1/4" g English Black Five for sale

- Steam locomotive, 4-6-0 wheel config., very little use, copper boiler, brass tender, current boiler certificate. Urgent sale offers Ph Greg (07) 32787768

### 7 1/4" gauge Railway for sale

- Over 1 kilometre of track, 2 bridges, 9 sets of points, turntable, 7 riding cars, one 700 class petrol-electric loco an old shunting loco

and heaps of other gear. Ph Rod (08) 8536 2489 for information.

### Auction Sydney 10 May 1997

- Steam gear and railway memorabilia - including original NSW loco and shed fittings, steam locos 2" to 7 1/4" gauge - Clayton and Shuttleworth articulated steam lorry 2" scale and selection from prominent and private collections. Additional entries welcome. For further info Ph Graeme (049) 50 4196

### Steam engine for sale

- vertical marine type, 2 1/2" x 3" bore & stroke, Stevenson link motion reverse gear, double acting, flywheel 6" x 2" stands 21" high new, expertly made, would be very good demonstration or glass case exhibition display model, can be seen running on air. \$1775.00 Ph Don (03) 9370 5796

### Whistles for sale

- Working chime whistles, lost wax cast, lever operated true scale NSW 5-chimes, suit 7 1/4" gauge or 5" \$95.00 + P&H. Ph Scott (02) 9587 2507 or Fax (02) 9588 1604 to order. *These whistles will wake the dead!*

### Computer Index

- Fast easy no-frills computer index for full AME Oct 87 to Feb 97. IBM compatibles 386 or later, DOS or DOS window. No run-time module needed. Data is user-editable ASCII. Set includes own fast search program. Outputs to screen, file or printer. Other indexes (ELM, LS & MEW) also available in a limited range price depending on number of issues covered. On 3.5" disc only. AME is \$20 posted within Australia, AS23 elsewhere. Updates \$5 per year. Peter Dawes, PO Box 758, Orange, NSW, 2800, Australia.

### Traditional English Traction Engines

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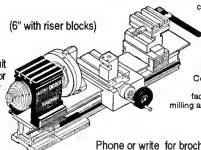
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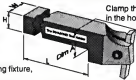
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well as 4 full colour paintings of "K1" in service. The full text is in English and French, the book has 164 pages and is paperback. The book is accompanied by a separate boxed set of 147 drawings showing over 70 items of from the Tramway, locos, rolling stock, stations, trackwork, earthworks etc., which are drawn to 1/40 scale for 32mm track gauge. Price? Certainly! But absolutely superb and, in our totally biased opinion, worth every cent!

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## Locomotive Cyclopedica (1930)

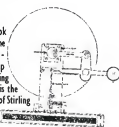
As reviewed in AME Sept-Oct 96 issue, this is a total reprint of the 1930 Cyclopedica - all 1440 pages and 4.4 kgs of it! There are enough drawings and detail technical information on American steam locos here to satisfy the most discriminating (or pernickety!) By 1930 American steam was in its last stages of development, and this must be close to the ultimate steam loco. It also covers electric and petrol/diesel cars and locos, plus most other things. Phenomenal! Hardbound. (Supplies of this book can be erratic, but at least as we go to press we have reasonable stocks....)

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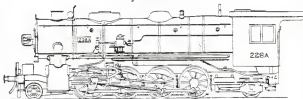


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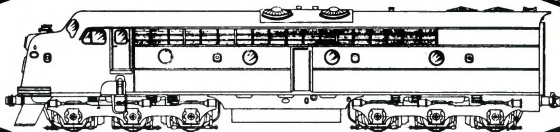
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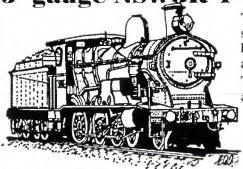
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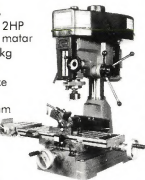


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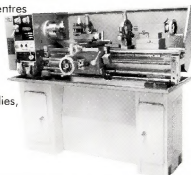
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